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USSR Report

SCIENCE AND TECHNOLOGY POLICY

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ORGANIZATION, PLANNING AND COORDINATION

IMPROVEMENT OF MANAGEMENT OF SECTORIAL SCIENCE

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA EKONOMICHESKAYA in Russian No 1, Jan 86 pp 82-90

[Article by Yu.V. Lebedev: "Urgent Questions of the Management of Sectorial Science at the Present Stage"; first paragraph is IZVESTIYA AKADEMII NAUK SSSR. SERIYA EKONOMICHESKAYA introduction; passages within slantlines published in italics]

[Text] The questions of the improvement of the management of sectorial science are examined in the article. In particular, the need for the transition from the management of the elaboration and introduction of the individual scientific and technical measure to the management of the sectorial scientific complex as a whole is demonstrated and the task of reappraising the principles, which are the basis for the economic and organizational mechanisms of the management of the scientific and technical development of production, is posed.

The improvement of the organizational and economic mechanisms of the management of scientific and technical progress in the sector is today one of the central tasks in the assurance of the further growth of production efficiency and the increase of the well-being of the Soviet people.

The shift of the center of gravity to the primary use of intensive factors in the development of social production at the present stage should be regarded as the natural process of the transition to the solution of the qualitatively new problems of economic development. It is a question first of all of the substantial technical updating of the most important physical components of social production on the basis of the achievements of modern science and of its technical renovation and retooling.

With the increase of the intensification of the production process the qualitative indicators of its development acquire infinitely greater importance than before. Thus, for example, during the period of 1970-1982 the capital-labor ratio on the average for physical production increased by nearly twofold--from 7,800 to 15,400 rubles per employed person, in addition it increased in construction by 137 percent, in industry by 107 percent, in agriculture by 101 percent, and in transportation by 73 percent [3, pp 47, 383]. Here it should be noted that to the present in physical production a

lag of the growth rate of labor productivity behind the growth rate of the capital-labor ratio has been observed. Thus, for example, during the period from 1970-1982 the productivity of national labor in industry increased by 51 percent and in transportation and communications by 46 percent. On the average for physical production it increased by only 45 percent. This attests to a decrease of the output-capital ratio.

The ratio of the indices of the growth of labor productivity and the capital-labor ratio during the period of 1975-1985 is depicted in Table 1. The indicated ratio characterizes the capital-output ratio, which, as is evident from Table 1, prior to 1981 tended to decrease, and only in 1982 did the growth rate of labor productivity in the basic sectors of industry lead the growth rate of the capital-labor ratio.

Table 1

Output-Capital Ratio by Basic Sectors of Physical Production During the Period of 1975-1982

Sectors of physical production	Year 1975	1980	1981	1982
Industry	0.86	0.86	0.97	1.01
Agriculture	0.62	0.78	0.99	1.03
Construction	0.84	0.7	0.95	0.98
Transportation and communication	0.98	0.83	0.97	1.06
Trade, procurement, material and technical supply and others	0.84	0.7	0.95	0.98

The decisive role in the technical development and organizational improvement of production belongs to science. During the period from 1960 to 1983 significant quantitative and qualitative changes occurred in domestic science. The number of scientists, including science teachers, increased during the indicated years from 354,200 to 1.44 million, or by more than threefold. The average annual rate of increase of the number of scientists came to 11.4 percent. The expenditures on scientific research during this period for the country as a whole by means of assets of the budget and other sources of financing increased from 3.9 billion rubles to 26 billion rubles, or by 6.6-fold. The average annual rate of increase of the expenditures on science came to 17 percent.

The data presented in Table 2 characterize the dynamics of the expenditures on science and the number of scientists in the USSR.

The comparative analysis of the growth rate of the expenditures on science from various sources shows that the expenditures on it from the assets of the state budget increased by 5.7-fold, while the expenditures from assets of other sources increased by 7.8-fold.

In our country the basic scientific forces are concentrated in sectorial science. At the end of 1983, 129,700 people, or 9 percent of the total number of scientists and science teachers, worked at the USSR Academy of Sciences,

the academies of sciences of the union republics, and sectorial academies. It is also well known that the bulk of scientific research is being conducted within sectorial science.

Table 2

Expenditures on Science and the Number of Scientists in the USSR During the Period from 1960 to 1983

Name of indicator	Unit of Measurement	1960	1970	1975	1980
Expenditures on science including	billions of rubles	3.9	11.7	17.4	22.3
from state budget	billions of rubles	2.172	6.425	7.893	9.946
from other sources	billions of rubles	1.728	5.275	9.507	12.354
Number of scientists (including science teachers)	thousands at end of year	354.2	927.7	1223.4	1373.3

Name of indicator	Unit of Measurement	1981	1982	1983
Expenditures on science including	billions of rubles	23.4	24.9	26.0
from state budget	billions of rubles	10.71	11.553	12.541
from other sources	billions of rubles	12.69	13.347	13.459
Number of scientists (including science teachers)	thousands at end of year	1411.2	1431.7	1440.0

Source: [1, p 9, 2, p 732]

A characteristic trait of modern sectorial science consists in the fact that today it is represented by already formed sectorial scientific complexes. The sectorial scientific complex is a developed network of sectorial scientific research institutes and organizations of scientific service, which ensure the possibility of the performance of the necessary amount of scientific research, experimental design, and planning work within the framework of the elaboration and implementation of the corresponding scientific and technical policy in the sector.

The development of sectorial science is inseparably connected with the improvement of the organizational forms of scientific activity and first of all in the direction of bringing them closer to the immediate needs of production. Today in sectorial science it is possible to observe such combined forms as, for example, scientific production associations. There are also narrow specialized scientific research organizations, such as design bureaus and planning and introduction organizations.

The existence of diverse organizational forms of scientific activity in the sector characterizes the qualitatively high level of its development. The practical possibilities of sectorial science today have increased immeasurably, to which, in particular, the fact that the number of introduced scientific and technical measures is increasing with each year, attests. During the 10th Five-Year Plan 531,000 measures on new equipment were introduced on the average in a year, while during the 11th Five-Year Plan 733,000 measures were [3, p 100].

However, it is well known that along with the increase of the number of measures being introduced the number of elaborated, but unintroduced measures is also increasing. The increasing social needs for new scientific and technical decisions, which make it possible to solve the vital problems of the development of production, not only are posing new problems for science, but also dictate the urgent need for the improvement of the economic and organizational mechanisms of the management of sectorial science.

The existence of unintroduced scientific and technical decisions at present is mainly explained both by the lack of adequate capital investments and by factors of an organizational nature. But, in our opinion, these explanations rather indicate the effect, and not the cause. The cause of the nonintroduction of completed developments, in our opinion, is rooted much deeper: it lies in the very concept of the management of the scientific and technical development of production in the sector.

In the management of the scientific and technical development of production in the sector the individual scientific and technical measure remains to the present the object of management. Planning, financing, monitoring, stimulation, the evaluation of the economic results--everything is organized so as to ensure the continuity of the movement of a scientific and technical measure at all stages of the cycle--from research to production. At the very beginning stage, in the process of scientific development, the distribution of public assets among individual measures occurs, and this distribution is maintained up to the stage of introduction. In such a concept of management scientific and technical progress acts as the sum of the individual scientific and technical measures. The cumulative economic result, which is obtained in the sector, in essence determines its content. The indicated approach was justified during the period, when the directions of scientific activity were dictated by production. At present, when the scale of the research and development being conducted by sectorial science has increased significantly, the demands being made on it have also changed. Today it is necessary that the development of the material and technical base of production would guarantee society the necessary growth rate of the productivity of labor and its efficiency. Therefore, today it is important to achieve not the efficiency of individual scientific and technical measures, but the steady constant increase of the efficiency of all science. Hence it follows that it is necessary to shift from the management of the individual scientific and technical measure to the management of the process of the scientific and technical development of production as a whole. Consequently, the planning, financing, monitoring, stimulation, and evaluation of the economic results of the scientific and technical development of production should be carried out in the direction of the assurance of qualitative changes in its material and

technical base. Here it is unimportant what number of scientific and technical measures are behind this. It is important what qualitative changes will be achieved in production owing to the use of the achievements of science and technology.

For the management of sectorial science such an approach means that one should reject the management of the individual scientific development and make the management of the sectorial scientific complex as a whole the cornerstone. This likewise means that it is also necessary to reject the demand, in accordance with which any development begun by science should conclude without fail with its introduction in production.

However, practical experience shows that the organizational and economic mechanisms of the management of sectorial science, which are being implemented today, are becoming more and more established. This is being observed in case of the changeover to the planning of research and development on the basis of the system of supply orders, in case of the changeover to their financing by means of credits of the State Bank, in case of the improvement of the stimulation of developers for the actual economic impact mainly at the expense of the additional profit, which is derived by the user of the new equipment, and in case of the improvement of the method of calculating the economic impact on the basis of the principle of adjusted expenditures. From this it follows that the basic principle of the management of the individual scientific and technical measure is also becoming stronger.

In order to raise the management of sectorial science to a qualitatively new level, it is necessary, as was already noted, to revise radically the existing underlying concept in this area. In other words, it is necessary that the sectorial scientific complex as a whole would be the basic object of management. Here the results of scientific activity should be evaluated not by the amount of performed research and development, not by the amount of assets spent for these purposes, not by the number of new technical decisions, but by the increase of the technical and economic level of production in the sector. In such a case not the sum of scientific and technical measures will determine the rate of scientific and technical progress, while the realization of the planned rate of the scientific and technical development of production in the sector will act as the criterion in the evaluation of the effectiveness of sectorial science.

It should be noted that such reorientation in the object of the management of scientific activity in the sector also implies the qualitative reform of the entire system of the management of the scientific and technical development of the sector. First of all the problem of the comparison of the scientific factor in the sectorial production structure with all the other production factors arises. Whereas at present in the management of sectorial science the requirement of "continuity" at all the stages of the "research--production" cycle is mainly realized, under the new conditions a new requirement--the "proportionality" of the scientific factor--will appear. In other words, while recognizing science's decisive role in the development of production, we should determine it quantitatively and qualitatively in relationship to the other production factors.

In this case the requirement of the assurance of the continuity of the "research--production" process is not at all removed from the agenda. The point is that this requirement alone is now no longer sufficient, since today it is important not only what will be achieved, but also at what price. Thus, today the problem of establishing the standard (social) demands, which are made on sectorial science, is being posed. Consequently, the requirement of "continuity" in the management of sectorial science is being supplemented by the requirement of "proportionality." This implies a qualitatively new stage in the development of the system of the management of sectorial science, since given the assurance of the continuity of the "research--production" process the singling out of its quantitative and qualitative parameters is carried out /from what is possible/. The realization of the requirement of the "proportionality" of the "research--production" process and its comparison with all others processes in the sectorial production structure require one to proceed when determining the qualitative and quantitative parameters of this process /from what is necessary/.

In practice this implies that the amounts of scientific research and the expenditures on them of manpower, material, and financial resources should be in a standard ratio with the results which are obtained from the introduction of the achievements of science and technology in the sector. The very results of scientific activity should be evaluated on the basis of the criterion of the rate of the scientific and technical development of production.

The supplementing of the management of sectorial science with the requirement of "proportionality" implies not only its functional expansion, but also the necessary qualitative reform of the economic and organizational mechanisms of management.

The indicators, which characterize the result of the scientific activity of an organization, hold the central place in the economic mechanism. The amount of the annual economic impact is such an indicator. It should be noted that in the management of scientific research at present we are encountering the indicator of the economic impact, behind which at times a different content lies.

Thus, for example, when planning scientific research work the amount of the anticipated annual national economic impact, according to the recommendations of the State Committee for Science and Technology, should be specified as compared with the best examples of the scientific and technical decisions which exist in our country or abroad. After the completion of research and development it is recommended to make the calculation of the planned annual national economic impact as compared with the best examples of the equipment which is in operation in the sector. In case of the evaluation of the actual results from the introduction of developments it is recommended to make the calculation of the actual annual economic impact in the national economy as compared with the equipment actually being replaced at the specific enterprise. Here only that portion of the impact, which was specified in consultation with the coperformers and the enterprise which is introducing its developments, is credited to the scientific research organization when evaluating its activity.

For the stimulation of the developers of new equipment the amount of the actually obtained economic impact during the first 2-3 years is taken into account. For the evaluation of their activity it is possible to take into account the amount of the economic impact for a period of up to 6 years, if it is acknowledged that in their scientific and technical level the new developments surpass or correspond to the best scientific and technical achievements in the given field of science and technology in our country or abroad.

The actual economic impact, which was obtained in the national economy from the introduction in production of the results of the scientific research developments which were carried out by the corresponding organization, is a genuinely active category in the economic mechanism of the management of sectorial scientific research and development. This is connected with the fact that the amount of the contributions to the economic stimulation funds of the scientific research organization depends on the amount of the actual economic impact. Moreover, it should be noted that the cumulative actual economic impact, which was obtained during the year by the scientific research organization from the introduction of the results of research and development, is determined by the amounts of the economic impact, which is obtained from results which are being introduced for the first time, and the economic impact, which is obtained from repeated introduction, that is, from the dissemination of an innovation (it is recognized as such, if the first introduction occurred no earlier than 6 years ago).

The amount of the actual economic impact today is the most important characteristic of scientific activity in the sector. However, we will not find this indicator among those which are planned today for the scientific research organization. The amount of research and development being performed, their estimated cost, and the number of personnel of the scientific research organization, which they specify for it annually, as a rule, with a constant decrease, if one proceeds from the plan indicators, are regarded today as the basic result of its work. The number of administrative and management personnel and the maximum allocations for operating expenses are also specified in a planned manner.

The amount of the economic impact, the planned or actual amount, today performs the role of an estimated indicator. However, it is well known that the actual economic impact depends not only on the level of the scientific and technical decision, but first of all on the conditions and scale of its use in practice. Therefore, in the work of the sectorial scientific research organization, as they say, no 2 years are alike. The indicator of the efficiency of work, which was introduced in the practice of the evaluation of its activity, did not improve the formed state of affairs; in this connection let us speak first of all about the indicator itself. It is calculated as the ratio of the amount of the obtained actual economic impact during the given (evaluated) year, for which the scientific research organization accounts, to the expenditures of this organization on scientific and experimental design operations during the same year. Moreover, it is recommended to take only a portion of the expenditures, since the expenditures on research and theoretical work, on work on special themes, and on the elaboration of scientific and technical measures, with respect to which the economic impact

is not calculated, for example, on nature conservation measures, are not taken into account. It is also recommended not to take into account the expenditures on patent research, operations of an information and economic nature, and activity on the preparation of various standard documents: standards, rates of consumption of raw materials and materials, and others. As we see, the scientific and technical activity of the sectorial scientific research organization in the amount of expenditures is greatly reduced and is represented only in part when calculating the economic efficiency or, as they say, the ruble per ruble return.

Moreover, in the calculation of this indicator, in our opinion, there are also a number of procedural contradictions. It is well known that a time lag exists between the making of expenditures on research and development and the obtaining from the introduction of their results of an actual economic impact. The comparison of the obtained results with the direct expenditures due to the difficulties of the discounting of the efficiency of individual operations to a single period makes the obtaining of a final generalizing characterization difficult. It turns out that the result of some operations is compared with the expenditures on other operations, the return from which will exist only in the future. Such an approach, as we see, completely eliminates the individuality of each individual scientific research operation. The second thing that causes bewilderment is the double counting of the expenditures when calculating the efficiency. The amount of the economic impact is defined as the difference between the amount of the annual saving and the amount of the expenditures which are connected with the development and introduction of the results of research and development. Here the latter is reduced to the accounting period according to the time factor, as well as to an annual scale by the standard coefficient of efficiency (E_s), which is equal to 0.15. Consequently, in case of the calculation of the indicator of the efficiency of the work of the scientific research organization we take the expenditures into account twice. One time in adjusted form, the other time in absolute form.

For all the importance of the indicator of the amount of the annual actual economic impact we should all the same recognize that this indicator cannot give an exhaustive characterization of the activity of the sectorial scientific research organization. Thus, for example, the results from the introduction of nature conservation measures and other types of social impacts, which are obtained in the national economy from the developments carried out by this organization, are not taken into account in any way. But the basic contradiction, which, in our opinion, exists today in the economic mechanism in connection with the use of the amount of the annual actual economic impact, consists in the fact that this indicator is in no way connected with the plan indicators of the activity of industrial enterprises in the area of the pursuit by them of the scientific and technical policy.

The increase of labor productivity, the decrease of the production cost per ruble of commodity production due to the increase of the technical level, and the saving of specific types of raw material and energy resources are specified in a planned manner for the industrial enterprise.

The lack of an interrelationship in the plan indicators in the planning of the activity of sectorial scientific research organizations and in the

planning of the pursuit of the scientific and technical policy at industrial enterprises of the sector attests that at present in essence there is not yet a unified economic mechanism of the management of the "science--production" system. The development of such a mechanism requires the corresponding reform of both the economic and organizational mechanisms of management, since both science and production within the framework of the unified system with respect to their new qualitative level are already different from science and production proper during the period when they functioned relatively independently. The integration of science and production at the present stage requires the fundamental revision of the principles of the management of the scientific and technical development of the sector simultaneously in both the economic and organizational respects.

First of all the elaboration of new unified economic criteria of the evaluation of scientific and technical activity both for the sectorial scientific complex and for industrial enterprises, as well as the search for new forms of the expression of the economic results of the scientific and technical development of production, in our opinion, will be the most important direction in the improvement of the economic mechanism.

The saving obtained in the sector from the use of the results of science and technology in economic practice is, in our opinion, one of the indicators which belong to such a form. An economic impact is guaranteed only if an absolute or relative saving is achieved in production. Precisely it first of all also determines the importance of the qualitative development of the material and technical base of production. The saving as an indicator of scientific and technical activity is coordinated with the indicator of the decrease of the production cost per ruble of commodity production, which is planned for industrial enterprises. The merits of this indicator also consist in the fact that it is possible to trace the decrease of specific types of expenditures with respect to the planned and actual rates of consumption, which are depicted in the calculation of the product cost.

Here the opportunity appears to establish a standard ratio between the economic result and the expenditures on the scientific and technical measure by the standard definition for the latter of the lower limit of their effectiveness, which, in our opinion, should not be less than the achieved level of effectiveness in the given production process.

The amount of the saving will make it possible to evaluate more accurately the efficiency of the work of the sectorial scientific research organization. The ratio of the amount of the annual saving, which has been obtained in the national economy from the introduction of the results of scientific research, to the amount of the annual expenditures on the upkeep of the given organization will also characterize the level of efficiency of its activity.

The amount of the annual saving can act as a plan assignment, which is calculated on the basis of the established standard of efficiency and the amount of the expenditures on the scientific and technical development of production. Owing to the physical form of the expression of the saving the ministry and the all-union industrial association can specify, depending on the adopted priority guideline, what types of resources first of all should be

saved in production. Thus, the opportunity to establish for sectorial science plan assignments on the decrease of the consumption of specific types of material and manpower expenditures appears.

The functional development of the system of management by the implementation of the additional requirement of "proportionality" also presumes, as was already noted, the improvement of the organizational mechanism of management.

At present in the sector there are three levels of management: the level of the enterprise (organization), the level of the all-union industrial association (VPO), and the level of the ministry. Within the framework of the existing practice of the management of scientific research and development in the sector, which is based first of all on the assurance of the "continuity" of the passage of a scientific and technical measure from research to introduction in production, each of the indicated levels in essence performs the same functions of management in the area of planning, financing, monitoring, reporting, and stimulation. The triple duplication in the implementation of the functions of management has the result that the middle level--the all-union industrial association--is as if an intermediate, connecting link in the information supply of the top level of management--the ministry. Here there are not sufficient means at either the level of the all-union industrial association or the level of the ministry to actively influence the assurance of the continuity of the process of scientific research, since for this it is necessary with sufficient efficiency to intervene in the specific situation with respect to each individual scientific research operation. But within one technical department of an all-union industrial association or even an administration of a ministry it is impossible to gather such a number of specialists, who have so broad a range of theoretical, scientific, and technical knowledge, that they would be capable of giving the necessary assistance to each developer in the sectorial scientific complex. It is inconceivable that the limited collective of the staff of an administration of an all-union industrial association or ministry could compete in the level of diversity of scientific knowledge with the collective of the entire sectorial scientific complex.

Consequently, only the management of the scientific research organization can in a high-quality manner monitor the situation and ensure the continuity of the "research--production" process. At the level of the all-union industrial association and ministry such monitoring is turning into merely the registration of faits accomplis. With the increase of the scale of the research and development, which are being conducted by sectorial science, at the level of the all-union industrial association and ministry under the actually existing conditions of the assurance of the continuity of the "research--production" process management is reducing more and more to the formal statement of faits accomplis. Neither the staff of the administration of the all-union industrial association nor the staff of the administration of the ministry is capable of implementing the necessary anticipatory measures which contribute to the elimination of the causes of delay in the performance of work or the nonfulfillment of the established requirements. The attempt to offset the indicated inability by the preparation of various sectorial documents, which regulate in detail the functions of management: the planning, financing, monitoring, reporting, and stimulation of scientific

research, will not provide the necessary success. Since, first, the preparation and introduction of directive instructions, which are based on the generalization of practice, always lags behind its real content and, second, as we attempted to show, all these instructions are called upon merely to strengthen the now prevailing organizational and economic mechanisms in the management of sectorial science, of which the individual development is the object, while "continuity" is the basic requirement.

The broadening of the functional content of the management of sectorial science by means of the inclusion in it of the additional requirement of "proportionality" will make it possible to achieve the necessary functional specialization of each of the indicated levels of management in the sector. Such specialization will consist in the fact that the function of the assurance of the "continuity" of the process of scientific research will be attached to the management of the scientific research organization. Here it will need itself to decide what amount of research it is necessary to conduct and what its structure should be. It is important that the scientific and technical decisions, which have been elaborated and suggested for introduction, would ensure the necessary rate of the development of production and the increase of its technical and economic level and efficiency.

Management at the level of the all-union industrial association should, in our opinion, consist mainly in the specification of the standard demands, which are made on the state and results of the activity of subsectorial science, as well as in the carrying out of the monitoring of the fulfillment of these requirements.

The ministry should bear responsibility for the scientific and technical development of production for the sector as a whole, therefore, its function of management reduces to the elaboration of the standard demands, which are made on the sectorial scientific complex as a whole, on the establishment of its internal structure, as well as on the elaboration of measures on its development.

The proposed functional specialization will make it possible, in our opinion, on the one hand, to increase the responsibility for the state of scientific developments in the sector on the part of the scientific collectives and management of scientific research organizations and, on the other, to relieve the middle and upper levels of management of sectorial science of unnecessary information and routine work, which will give them much opportunity for the elaboration of the long-range problems of the development of sectorial science.

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ANALYSIS, FORECASTING OF RESOURCE SUPPLY OF SCIENCE

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA EKONOMICHESKAYA in Russian No 1, Jan 86 pp 46-58

[Article by L.E. Mindeli: "Methodological and Procedural Problems of the Study of the Scientific Potential (The Resource Aspect)"; first paragraph is IZVESTIYA AKADEMII NAUK SSSR. SERIYA EKONOMICHESKAYA introduction; passages within slantlines published in italics]

[Text] The article is devoted to the urgent problem of the analysis and forecast of the resource supply of science. In it the resource components of the scientific potential and their structure and sources of formation are examined, the characteristic, specific traits are distinguished. The questions of the choice of the set of indicators, which are intended for the description of each individual type of resources with allowance made for its peculiarities, are discussed. An approach, which is based on the methods of standard forecasting, is proposed for the making of a forecast of the resources of science for the long-range future.

The successful solution of the problems of socioeconomic development in our country in many ways is governed by the achievements of scientific and technical progress, which is influencing all aspects of social life and is acquiring a more and more extensive and all-embracing nature. This influence is appearing in the diverse processes which are occurring in the present economy, since precisely it is the most important object which uses the basic achievements of scientific and technical progress.

In turn the development of science, the accumulation and progress of knowledge, and then its materialization in new and more advanced means and objects of labor, technologies, and, finally, items of final consumption are the basis of scientific and technical progress. In speaking about the role of science under socialism, V.I. Lenin noted that "it is necessary that science in our country would not remain a dead letter or a fashionable phrase..., that science would actually become a part of one's flesh and blood, would fully and utterly turn into a component of daily life" [1]. The role and importance of science in the development of society and in the acceleration of scientific and technical progress were recognized at all the stages of the building of socialism. At present, when the acceleration of scientific and technical progress is one of the general directions of the economic strategy, the role

of science is especially increasing. M.S. Gorbachev in the report "A Vital Question of Party Economic Policy" at the conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress emphasized: "The front line of the struggle for the acceleration of scientific and technical progress runs through science."

The increasing role of science in all spheres of the life of society requires the comprehensive study of it as an object. This circumstance creates the need for the examination of various aspects of its functioning, in particular, the structure of resources, the basic laws of development, and the spheres of influence. It is possible to single out in concentrated form the following basic aspects of the study of science:

1) the study of the epistemology of creative scientific work, the mechanism and laws of the scientific process as a relatively independent sphere of activity, bearing in mind its specific internal function which was expressed quite tersely by A. Einstein: "...what we call science has as its exclusive goal to firmly establish what is" [2];

2) the study of the interconnection of science and economics, that is, on the one hand, the use of the results of science for the improvement of equipment and technology and the acceleration of scientific and technical progress and, on the other hand, the demands which are made on science on the part of the constantly increasing and changing needs of society;

3) the determination of the influence of scientific knowledge on social phenomena, in particular, on the all-round development of the personality of a person.

The conducted studies of the basic trends and stages of the development of science over the past 30 years demonstrate, first, the steady increase of the role of science in all spheres of the life of society and, second, the rapid increase of the amounts of all types of resources: human, material and technical, financial, and information resources, which are the basis of its development. At present a branched network of scientific organizations and institutions, which form an independent sector of the national economy, has formed in our country. The concept of the scientific potential is used for the characterization of the resource supply of science as a sector. By the scientific potential it is customary to understand the set of accumulated resources, which are in constant dialectical development and interaction with each other and with the environment (the economic, social, political, and other institutions of the given social formation), are united by specific organizational principles and management, and provide solutions of the scientific problems which are posed both by the needs of society and by the very progress of scientific knowledge.

In this work the study of the scientific potential as the set of available resources for the generation of scientific knowledge will interest us.

Diagram 1

[Key on following page]

Key:

1. Scientific potential (resource aspect)
2. Organizational resource
3. Manpower resources
4. Financial resources
5. Material and technical resources
6. Information resource
7. Science teachers
8. Auxiliary personnel
9. Capital investments
10. Current expenditures
11. Fixed capital
12. Materials, raw materials, fuel, and so on
13. Fund of scientific ideas, inventions, discoveries
14. Information base of science
15. System of training of scientists
16. System of education
17. State budget
18. Enterprises' own assets
19. Graduate studies
20. Work toward a degree
21. Sources

It is possible to represent the structure of the resource components of the scientific potential in the form of a diagram (diagram 1). In it the manpower (personnel), material and technical, financial, and information resources of science are singled out as the key components of the scientific potential. Their functioning is realized within a specific system of management, which is regarded as "the organizational resources" of science itself. At the next level of detailing each type of resources is differentiated according to the basic components which characterize their internal structure. The problem of meeting the need of the expanded reproduction of the individual resource components should be solved with allowance made for the basic sources of the replenishment of each type of resources.

Let us examine in greater detail the resource components of the scientific potential.

The Personnel of Science. The manpower resources of science, of which the creators of new knowledge--scientists--constitute the basis, are the most important and basic component of the scientific potential.

The inclusion of the personnel component in the scientific potential is connected with its special role in the development of science, which is due first of all to the specific nature of the "production" of scientific knowledge, which consists in the creative nature of the labor of researchers and the uniqueness of the thought process.

Two basic indicators--the number of scientists and science teachers and the number of people employed in the sector "Science and Scientific Service"--are used for the general characterization of the manpower resources of science in our country.

In case of censuses and current statistical accounting in the USSR the following categories of personnel are grouped with /scientists and science teachers/: academicians and corresponding members of all academies; all people who have an academic degree or academic title regardless of the place and nature of work; people who are performing scientific research work at scientific institutions, as well as scientific teaching work at higher educational institutions; specialists who are engaged in scientific work at

industrial enterprises and planning organizations. Technicians and laboratory assistants, who, although they perform scientific research work, do not have a higher education, as well as all people, who perform only pilot and experimental operations under the orders of a scientist, that is, do not directly perform scientific research themes in conformity with the plan of scientific operations, are not included among scientists and science teachers. Full-time graduate students and researchers in special courses even in case of their participation in the fulfillment of scientific research themes are taken into account separately and are not included in the category of scientists and science teachers.

The basic shortcoming, which characterizes this indicator, consists in the fact that people, who both actually engage in scientific research and in fact do not engage in it or engage in it only in part, but have an academic degree or academic title, are included among scientists and science teachers. It is quite obvious that for the more exact reflection of the number of personnel engaged in science one should separate the people, who are directly engaged in scientific research and should be included in the category of scientific personnel, from the people, who have scientific skills, but do not perform scientific work and who should not be included in the category of scientific personnel. Here if the former indicator should reflect the actual number of people engaged in scientific research, the latter would also give information about the possible reserve of scientific personnel.

In case of the distinction of /the number of people employed in the sector "Science and Scientific Service"/ the classification takes place according to the organizational attribute. Here the following types of organizations are taken into account:

1) institutions which perform scientific research,

2) independent design and planning institutions (except for the planning institutions of the construction and wood processing industry and technical institutions, which do not perform scientific work),

3) experimental enterprises which do not produce commodity production,

4) the hydrometeorological service; organizations for the long-range exploration of reserves of fish, whales, and other marine products,

5) organizations for the service of scientific institutions.

As follows from the list, institutions, the activity of which it is hardly possible to group with scientific activity (for example, the hydrometeorological service, institutions for the prospecting of marine products, and others), belong here. At the same time this indicator does not include a large contingent from the number of scientists and science teachers. In particular, the scientists, who are employed at chairs, and workers of the research subdivisions of higher educational institutions do not find themselves here, although workers of the scientific research institutions subordinate to higher educational institutions are taken into account. This indicator also does not take into account the workers of scientific research

laboratories of industrial enterprises, who actually perform scientific research work.

Thus, it is impossible to directly compare this indicator with the number of scientists and science teachers. It corresponds only to that portion of the entire group of scientists and science teachers, who are employed at organizations of the above-listed types. It should be noted that in addition to scientists proper it includes at the same time other categories of personnel (engineering and technical, auxiliary scientific, administrative, service, and so forth), who are employed at these institutions, but do not perform scientific work. It should, however, be taken into account that the study of the dynamics and structure first of all of scientific personnel, that is, the professionally trained workers who directly perform research in various fields of science, is the central task when studying employment in the sphere of science.

In scientific knowledge the "personality factor," which is responsible for a certain stochastic nature of the processes of obtaining scientific results and finds reflection in the demographic (sex-age) and occupational skills structure, various types of mobility of scientific personnel, and so forth, plays an important role. The system of concepts and the indicators, which are intended for the characterization of the personnel potential of science, are discussed in detail in work [3].

The availability of the necessary statistical data is one of the basic prerequisites of the analysis of the structure of scientists and science teachers. (Footnote 1) (For example, for all its importance the problem of determining the real ratios between the different types of scientific research cannot yet be solved satisfactorily, since not only the method, but the methodology of taking into account the corresponding indicators are lacking) However, in recent years in the area of the accounting of scientists, as well as of other components of the scientific potential our statistics has been lagging behind the increasing requirements of science. This is connected with the fact that with the complication of economic activity the characteristics in scientific activity also change rapidly, the methods of statistical accounting become obsolete, and the accuracy and reliability of the data decrease.

There is necessary in this connection the further improvement of the statistics of scientific personnel, which should be carried out in the following directions:

--the improvement of the existing indicators which concern scientific personnel (for example, the elaboration of more precise definitions of scientific specialties);

--the development of the corresponding classifications and the rules of their determination (for example, as applied to the breakdown of scientific personnel by types of scientific research);

--the introduction of the principle of the accounting of scientists in accordance with the time actually spent on various types of scientific research and scientific activity.

Material and Technical Resources. Material and technical resources, the amount and structure of which have a significant influence on the effectiveness of scientific research and development, are an important component of the scientific potential. The set of physical assets, which are attached to scientific institutions and appear in physical and material form, is the material and technical base of science. Here it should be taken into account that the material and technical base is not simply the means of production, but the means of production in their specific socioeconomic organization. The fixed capital and working capital of scientific institutions are the main elements when analyzing this resource component.

The development of a more adequate classification of scientific and technical equipment is one of the tasks of the improvement of the methodology of studying the scientific potential. On its part the practice of managing scientific research work also determines the need for the study of the structure of equipment, since the system of the accounting of means of labor, which has been adopted at present in science, does not conform to the specific nature of scientific activity. The existing enforceable enactments do not make distinctions in the determination of the fixed capital of science and physical production and in the classification of means of labor. The differentiation of the means of labor is extremely inadequate. Thus, for example, at sectorial scientific research institutes and design bureaus all scientific instruments and equipment fall into one accounting group, while at institutions of the USSR Academy of Sciences machines and equipment are taken into account without any breakdown, which eliminates the possibility of using reporting data for the analysis of the structure of equipment.

Various suggestions on the devising of classifications of tools of labor, which differ from those used in practice, exist. As a whole it is possible to distinguish here the following basic principles: the object principle, the principle according to stages of research, the functional principle, and the economic principle. In particular, the object approach recommends that one use as the basis of the classification of scientific instruments their purpose for the study of specific forms of matter or its movement. Here, for example, groups of instruments for the study of matter, electromagnetic measurements, space and time, and others are distinguished. In case of a classification according to the functional attribute it is proposed to distinguish such types of equipment as basic equipment, auxiliary equipment, and production equipment with the detailing of each type. The classification of equipment, which has been adopted at present in the system of reporting, first of all is economic. As was already noted, the method of breaking down fixed capital, which is not specific for science, as well as the lack of the distinction and the lack of the breakdown of the equipment of scientific labor as such are its main shortcoming. The analysis of the proposed methods of the classification of the equipment used when performing scientific work attests to the sharp difference of the groupings proposed in the literature and the classification actually being used in the practice of statistical accounting and reporting. When evaluating the state and directions of the development of the material

and technical component of the scientific potential the /fixed capital/ of scientific institutions and its quantitative and qualitative characteristics continue to remain the basic object of the analysis.

The buildings and structures, transfer devices, machines, and equipment, including pilot experimental installations (scientific research ships, radio telescopes, and so on), scientific instruments, means of automation and computer technology and so on, vehicles, tools, implements, and other fixed capital, which are carried on the balance sheet of the institutions and organizations belonging to the sector and are used for carrying out the basic activity of these organizations, are grouped with the fixed capital of the sector "Science and Scientific Service." For the study of fixed capital the use of a set of indicators, which characterize the sources of their formation, amount, dynamics, and structure, is necessary.

The specific nature of the formation of the fixed capital of science consists in the fact that capital investments and current material expenditures are to an equal degree its sources. This dictates the use of indicators, which characterize the dynamics and structure of capital investments and the proportion of the expenditures on instruments and equipment in the current material expenditures. The main indicators, which characterize fixed capital, are its growth rate, the technological and age structures, and the average actual service life. It is possible to judge the processes of replacement and retirement from the value of such indicators as the coefficients of replacement and retirement, the ratio of retirement to the increase of capital, and the proportion of the replacement of equipment in its deliveries. The listed indicators, while characterizing the increase of the amount of means of labor, which are used when performing research work, and the changes in their structure, do not give an idea of the level of equipment of labor at scientific research organizations. For its determination one should shift to the specific indicators of the capital-worker, equipment-worker, and instrument-worker ratios. The method of calculating the capital-worker ratio in science is analogous to the calculation of this indicator in industry, it is proposed to define the equipment-worker ratio as the ratio of the active portion of the fixed capital to the number of personnel of scientific institutions with respect to the basic activity (or to the number of scientific associates). When evaluating the fixed capital of the sector "Science and Scientific Service" the same procedural difficulties with the determination of the group of organizations and institutions, with respect to which the statistics of the capital are kept, arise as in the case of the examination of the personnel of science.

Financial Resources. The monetary assets from various sources (the state budget, the enterprises' own assets, and so on), which are used for the basic activity of the organizations of the sector "Science and Scientific Service," as well as for capital construction, capital repair, and the formation of economic stimulation funds, are grouped with the financial resources of science. A characteristic trait of the financial resources of science is their increased mobility as compared with other types of resource supply.

The peculiarities of the functioning of the financial resources in the process of scientific activity give rise to the need for the consideration of their

two characteristics: the breakdown by sources of financing, the structure of financial resources with respect to the elements of expenditures.

The first of the specified indicators makes it possible to judge the goal orientation of scientific research and the scale of its development in individual sectors of science and sectors of the national economy. The second indicator characterizes the direction and form of the distribution of the assets allocated for the conducting of research and determines the ratio between the material expenditures and the wage, which reflects the specific nature, level, and efficiency of the research and development, which are being conducted. The state budget, the internal assets of the enterprises and organizations, which form a unified fund for the development of science and technology, and credits of the State Bank are the basic sources of the financial resources of the sector "Science and Scientific Service." The assets with respect to economic contracts are nothing other than a form of the redistribution of assets from the primary sources among the enterprises, which are interested in the conducting of scientific research, on the one hand, and the organizations which are the performers of this research, on the other.

Current expenditures and the financing of capital investments are the basic items of expenditure of the financial resources. The expenses with respect to the wage fund, the operating and other expenses on scientific research work, and the expenses for the purchase of equipment and implements are grouped with the current expenditures.

The expenses for the purchase of equipment and implements together with the capital investments are the source of the formation of the fixed capital of scientific institutions and organizations. The scientific research expenses include the expenditures on the production of experimental mockups and prototypes of machines, the acquisition of materials, and so on, moreover, the expenses for the purchase of equipment are not included in them.

The wage constitutes a significant portion (approximately 50 percent) of the current expenditures on scientific research. The expenses for social insurance are directly associated with it. Capital investments are envisaged for the construction of new and the expansion and renovation of operating scientific research organizations and their pilot (experimental) bases. The expenses for construction and installation work and the expenses for the purchase of equipment, tools, and implements are among the most important structural indicators of capital investments.

The amounts and forms of the financing of science are regulated by the financial policy of the state, which is most closely connected with the system of management of science.

Of the large number of indicators which characterize the financial resources of science the indicators of the science intensiveness [4-6], the amount of expenditures per scientist, and the proportion of the capital investments in science in the total amount of capital investments are of the greatest interest. The studies conducted by us made it possible to establish that the last two indicators have over a long interval of time stable trends and, therefore, can be used in forecasting.

The Information Resource. Another opponent of the scientific potential is information resources. Their role and importance first of all consist in the processing, preparation, and submitting to interested organizations in convenient form and with adequate promptness of the necessary information for the conducting of scientific research and development; in the supply of information on the state and prospects of the development of science and technology in the USSR and abroad.

The accomplishment of the basic goals of the development of the information resources of science is being carried out by the State Scientific and Technical Information System.

The simple distinction of the resource components is inadequate for the study of the scientific potential. It is necessary to identify the set of indicators, which determine not only the quantitative characteristics and qualitative composition of each type of resources, but also the basic interrelations and interactions between these indicators and resources, as well as the connection between the indicators of the socioeconomic development of the country and the indicators which characterize the development of the scientific potential.

/On the methodological level/ this signifies the need for the establishment of a sufficiently well-balanced classification of:

a) the endogenous indicators of the development of both the scientific potential as a whole and its individual resource components, which are intended for the characterization of the functioning of science as an autonomous system which obeys specific laws of development;

b) the indicators which are exogenous with respect to individual types of resources, but endogenous with respect to the scientific potential as a whole;

c) the exogenous indicators, which characterize the level and proportion of the scientific potential and its individual resource components in social production.

Given the significant specificity of the endogenous indicators, which are used for the characterization of individual types of resources, it is possible to distinguish a number of breakdowns (attributes), which are common to all the resource components and reflect the organizational aspect of the functioning of the scientific potential. Among the most important breakdowns, which it is necessary to take into account when analyzing the indicators of all types of resources, there are:

--the regional breakdown, that is, according to the attribute of the distribution of resources over the territory of the country,

--the sectorial breakdown, that is, according to the affiliation of scientific institutions and the resources concentrated at them with individual sectors of the national economy,

--by sectors of science, meaning academic science, science of higher educational institutions, sectorial science, and plant science,

--by types of research--basic research, applied research, development.

From the standpoint of the methodology of the study of the scientific potential it seems important to distinguish the maximum of the possible spectra of the information supply breakdowns or attributes, which are common to all the resources components both for the assurance of the comprehensiveness of the analysis and for the development of exogenous indicators.

The exogenous indicators, which belong to groups b) and c), are usually relative, for example, the capital-labor ratio of scientific labor and the proportion of scientists in the total number of employees. Their set should ensure the comprehensive reflection of both the most significant intrasystem interrelations between the individual resource components of the scientific potential in the process of its functioning and the interrelations with social production in the general reproduction process.

The methodology of the analysis of the scientific potential should also take into consideration that science for all the specificity of the organizational forms, goals, and tasks in each individual country develops not autonomously, but is under the constant influence of the achievements of world science, that is, the planetwide aspect of the development of scientific knowledge should be taken into account. Thus, when analyzing the changes of the indicators of the scientific potential in different breakdowns it is necessary to turn to the experience and advanced achievements of world science and to make comparisons and contrasts between countries with reference to the system of advanced socialist social production. The legitimacy and great possibilities of the comparative historical approach have been stressed by many Soviet scientists [7,8].

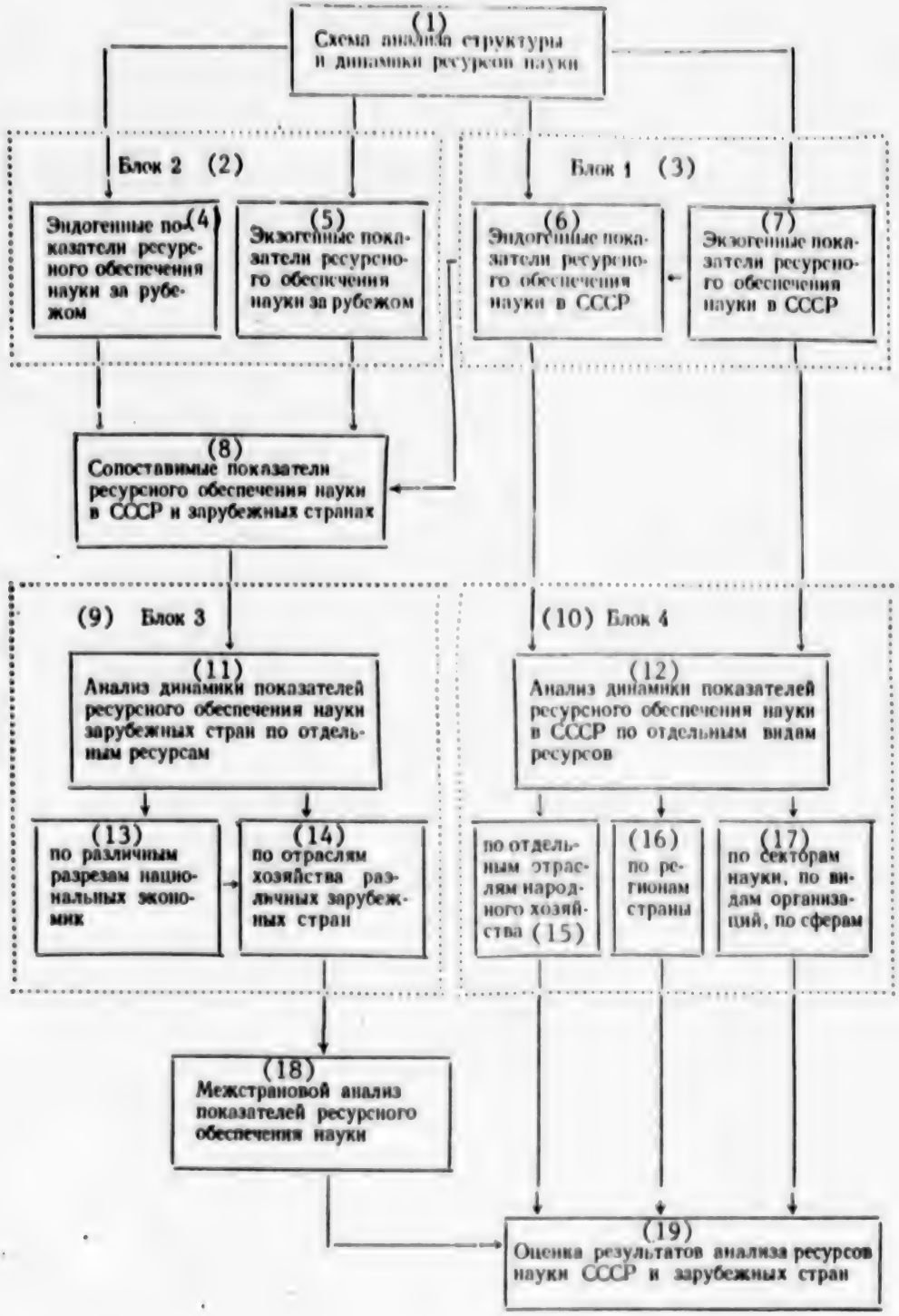
At the same time it should be emphasized once again that in case of an analysis among countries it is a matter first of all of the common laws of the development of science; the obtained results can have different socioeconomic consequences and should not be automatically carried over to our reality.

The common logic, or in a certain sense the "algorithm" of the analysis of the scientific potential can be depicted as a diagram (diagram 2). According to the diagram after the carrying out of the structurization of the scientific potential, that is, the distinction of its basic resource components, the endogenous and exogenous indicators, which are intended for the characterization of the functioning of the development of both the scientific potential as a whole and the individual types of resources, are determined.

Let us note that the distinction of the set of such indicators should be carried out both for domestic science (block 1) and for the scientific potential of the leading foreign countries (block 2). Here it should be taken into account that the difference in the conceptual system, which is used in different countries, as well as in the organization of the system of the gathering and processing of statistical information, gives rise to the need

for the additional study of the comparability of the existing indicators both in our country and abroad.

Diagram 2



[Key on following page]

Key:

1. Diagram of the analysis of the structure and dynamics of the resources of science
2. Block 2
3. Block 1
4. Endogenous indicators of the resource supply of science abroad
5. Exogenous indicators of the resource supply of science abroad
6. Endogenous indicators of the resource supply of science in the USSR
7. Exogenous indicators of the resource supply of science in the USSR
8. Comparable indicators of the resource supply of science in the USSR and abroad
9. Block 3
10. Block 4
11. Analysis of the dynamics of the resource supply of science of foreign countries by individual resources
12. Analysis of the dynamics of the resource supply of science in the USSR by individual types of resources
13. By different cross sections of the national economies
14. By sectors of the economy of different foreign countries
15. By individual sectors of the national economy
16. By regions of the country
17. By sectors of science, by types pf organizations, by spheres
18. Analysis among countries of the indicators of the resource supply of science
19. Evaluation of the results of the analysis of the resources of science of the USSR and

After the identification of the spectrum of common indicators, which are intended for the characterization of the resources of science both in our country and in other countries, a study of the dynamics of the changes of each of them is made with respect to the different breakdowns which determine the functioning of the scientific potential (the regional, sectorial, and other breakdowns, see diagram 2).

Finally, at the concluding stage the analysis among countries of the achieved level and trends of the changes of the selected indicators is made, and then the evaluation of the obtained results is carried out.

The results of the analysis, which were obtained on the basis of the consistent implementation of the above-examined methodological principles, can be used in at least two directions. First, the indicated results give extensive information for the solution of the problems of the management of the development of science both on the level of the making of operational management decisions and in the planning activity of the organs which deal with these questions. Second, they serve as the underlying base for the long-range forecasting of the scientific potential.

Let us dwell on the methodological questions which are connected with the forecasting of the resource supply of science.

At present mainly two approaches--the genetic and the standard--are used in forecasting. The former is based on the carrying over to the future of established stable laws and trends, the latter is based on the fixing of a specific goal (or set of goals) of the process being forecast and on the determination of a set of paths for its realization. The direct implementation of the latter for the forecasting of the development of the scientific potential causes significant difficulties, which stem, on the one hand, from the specific nature of science as the object of forecasting--the stochasticity of the obtaining of scientific results, the diversity of their manifestation, and the ambiguity of the influence on socioeconomic processes and so forth--and, on the other hand, from the lack of development of methods of the evaluation and measurement of the influence and the manifestation of the results of scientific activity in the national economy.

Owing to what was said above, the development of models, which link the indicators which characterize the scientific potential, and the indicators of socioeconomic development, causes significant difficulties.

The genetic approach, which usually uses extrapolation methods, has shortcomings which are connected with the carryover to the future of frequently adverse trends which formed in the past. However, owing to the fact that "the shifting of resources in science is carried out significantly more slowly than in other spheres of socially useful activity" [9], the use of extrapolation methods is entirely valid, but within a specific framework, when the horizon of forecasting does not exceed approximately 5 years. For lengthier periods of the forecast the use of the genetic approach is justified only if in the system of interrelations between the different indicators, which were obtained on the basis of econometric models, it is possible to distinguish indicators with stable trends as independent ones.

In case of the standard approach to the forecasting of the scientific potential it is necessary to formulate the basic goals of the development of science for a long-term period, on the basis of the general laws of the functioning of the object "science" as a system which has a number of specific properties; the influence of science on various aspects of social development; the socioeconomic demands on science on the part of the national economy; the possibility of satisfying the needs of science for resources of various kinds. It should be noted that the forecasting of the scientific potential requires either the formulation of the basic goals of the development of science in terms of the scientific potential itself or the establishment of relations between the resource components of science and the goals of socioeconomic development by means of methods of modeling.

The peculiarities of the use of the genetic and standard approaches to the forecasting of the scientific potential also involve the determination of a representative set of "economic factors, which pertain to the concluding stage of the long-range future and the period of development, which is beyond it, which should be taken into account in the scientific research being developed today" [9].

The studies, which were conducted by us on the analysis of the absolute and relative indicators of the scientific potential and their interconnection with

the national economic indicators, made it possible to infer the advisability of the use of the standard approach to the forecasting of the resource supply of science for the long-range future.

The results of the contrasts between countries, which were obtained at the stage of the analysis of the scientific potential, were used as a possible means of devising standards for the forecasts of the resources of science. The process of devising these standards included several stages. At the first stage the base indicators of the development of the scientific potential are selected. It should be noted that at present various indicators of the resource supply of science, such as the total and current expenditures on research and development, the fixed capital, the number of people employed in science, and so on, are used in case of the comparative analysis of the scientific potential among countries.

In our opinion, the indicators, which are connected with the number and structure of scientists, is most informative, which is explained by the following factors.

First, scientific personnel are the main component of the scientific potential. In contrast to physical production the tools of labor in science are used not so much for the replacement of manpower as for the increase of the capacity of human intelligence. Second, as the made calculations showed, the indicator of the number of scientists has the most stable trends as compared with the other indicators of the resource supply of science. Third, the indicator in question is a natural one, and, therefore, the difficulties connected with the use of cost estimates are absent. And, finally, under the conditions of the further expansion of the scale of research and development the role of scientists increases as a result of the increasing dependence of the development of science on this component of resources as a limiting factor.

At the same time for the more complete consideration of the resource components of the scientific potential it is necessary to supplement the set of base indicators with the indicators of the development of its other resource components, such as the current material expenditures and the wage of those employed in science.

At the second stage the countries, which hold the most advanced positions in the development of economics and science, are distinguished. Here the indicators, which characterize the economic, social, and technical development both as a whole with respect to each of these countries and with a breakdown by sectors of their physical production, were examined.

Further a comparative analysis of the indicators of the development of the scientific potential of the USSR and the selected countries is made.

When making this analysis particular attention should be devoted to the assurance of the comparability of the indicators in question. It seems advisable to carry out the conversion of foreign indicators so that in their composition they would conform most completely to the indicators of Soviet statistics. In particular, scientific personnel are compared as physical

persons, and not in the equivalent to full employment, which is used in the statistics of a number of capitalist countries; the parity of the purchasing power of the dollar with respect to the ruble in science is calculated according to value indicators.

Finally, at the third stage the standard estimates of the indicators chosen for the forecast are formulated on the basis of the analysis made at the second stage, with allowance made for the peculiarities of the development of the scientific potential of our country.

When making the calculations we propose to use the following indicators: the proportion of scientists in the size of the population η; the proportion of scientists in the number of employed people w and the amount of current material expenditures per scientist p both for the economy as a whole and by its individual sectors (w_i, p_i).

The following procedure, which consists of several stages, is proposed for the making of the forecast.

/First/.

By using the standard value of the proportion of scientists in the population ($\eta^н$), by means of models of the reproduction of the population [10] and scientists [3] of the USSR, the parameters of which are identified retrospectively, we determine the time (T), during which the level of $\eta^н$ in the USSR can be achieved.

If T fits within the given forecasting period, there is no need to make adjustments in the policy of the training of scientists. Otherwise, that is, when T goes beyond the boundary of the forecasting period, the achievement of $\eta^н$ can be accomplished by changes in the strategy of the reproduction of scientists. Within the model being used [3] this implies the varying of its parameters with allowance made for the restrictions on their change. If in this case the formulated problem does not have a permissible solution, the problem of seeking the maximum possible value of η for the USSR during the forecast interval of time arises. By having a forecast of the size of the USSR population, we obtain a forecast of the number of scientists at the moment of time T and the path of its achievement.

/Second/.

On the basis of the standard of the saturation of physical production with scientists $w^н_{мп}$ and the forecast of the number of people employed in physical production in the USSR $L^э_{мп}$, we determine the number of scientists who are employed in physical production $L^{нр}_{мп}$ and the nonproduction sphere $L^{нр}_{нс}$. Further, by using the sectorial standards $w_i^н$ and the forecast values of the number of people employed in these sectors $L_i^э$, we will obtain the breakdown of scientists by all sectors of physical production $L_i^{нр}$ at the moment T:

$$L_i^{пр} = \frac{w_i^н L_i^з}{\sum_{i=1}^{N} w_i^н L_i^з} L_{мп}^{пр},$$

where N is the total number of sectors of physical production.

By knowing the forecast breakdown of the number of people employed by sectors of physical production at moment T, we determine the value of w_{iT} for each of the sectors of physical production. We make a comparison of the standard $w_i^н$ and the estimated w_{iT}. If $w_{iT} \geq w_i^н$ for all i, we leave the number of scientists unchanged. If for the set J of priority sectors $w_{jT} < w_j^н$ ($j \in J$), we adjust the obtained breakdown of the number of scientists in the following manner:

1) we determine the number of scientists in the priority sectors of physical production, based on the fact that here w_{jT} should be not less than the standard values ($w_{jT} = w_j^н$);

2) we determine the number of scientists who are employed in the remaining K sectors of physical production (K = N - J)

$$L_i^{пр} = \frac{(L_{мп}^{пр} - \sum_{i \in J} L_i^{пр}) w_i L_i^з}{\sum_{i=1}^{K} w_i^н L_i^з}.$$

/Third/.

By using the standards p and p_i, in much the same way as the procedure of the second stage we will obtain the values of the current material expenditures at the moment of time T for the national economy, physical production, the nonproduction sphere, as well as for the groups of priority and nonpriority sectors.

/Fourth/.

On the basis of the forecast of the number of scientists at moment T, by using a regression model which links the number of scientists and people employed in science, we determine the number of people employed in science at moment T.

We set the standard amount of the average wage of the people employed in science at moment T, which is determined with allowance made for the average wage of the workers and employees in the national economy, the increase of the skills level of scientists, and the change of the proportion of auxiliary personnel in the structure of the people employed. Thereby we determine the total wage fund of the people employed in science.

By adding up its amount with the amount of current material expenditures, we obtain the amount of current expenditures on science in the USSR.

In conclusion let us note that the examined methodological principles of analysis and forecasting are quite general. They can be given concrete expression and be specified in the process of elaborating practical methods of their implementation, as well as with the gaining of experience in the forecasting of such a complex and "nontraditional" object as the scientific potential is.

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IMPORTED VERSUS DOMESTIC TECHNOLOGY DISCUSSED

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[Article by Mikhail Antonov under "Feature Story and Publicism" rubric: "The Harmony of Progress: Toward the 27th CPSU Congress"]

[Text] COMRADES! THE CPSU SEES THE HIGHEST IMPLICATION OF ACCELERATING THE COUNTRY'S SOCIOECONOMIC DEVELOPMENT IN STEADILY, STEP BY STEP, IMPROVING THE PEOPLE'S WELFARE, IMPROVING ALL ASPECTS OF THE LIFE OF THE SOVIET PEOPLE, AND CREATING FAVORABLE CONDITIONS FOR HARMONIOUS DEVELOPMENT OF THE PERSON. IN THIS REGARD, IT ISNECESSARY TO CONSISTENTLY FOLLOW A LINE TOWARD STRENGTHENING SOCIAL JUSTICE IN THE DISTRIBUTION OF MATERIAL AND SPIRITUAL WEALTH, REINFORCING THE EFFECT OF SOCIAL FACTORS ON DEVELOPMENT OF THE ECONOMIC SYSTEM AND IMPROVING ITS EFFICIENCY.

FROM A REPORT BY CPSU CENTRAL COMMITTEE GENERAL SECRETARY M. S. GORBACHEV AT THE APRIL 1985 CPSU CENTRAL COMMITTEE PLENUM.

Among the successes of Soviet science and technology of world-wide historical importance suffice it to recall the launching of the world's first artificial satellite of the earth and history's first manned space flight--a striking illustration of the creative endowments of our people and the great resources of the socialist system. And today many types of products that are being produced in the USSR (for example, the machining centers that are being manufactured by the Ivanovo Machine Tool Association imeni 50th Anniversary of the USSR) surpass similar models of the best foreign firms.

However, the present rates of scientific and technical progress, development time frames, and the quality of many kinds of products cannot satisfy us. Cases of a loss of our priority are disturbing when a new idea is conceived in our country, but it ispatented and "realized in the metal" abroad earlier and we sometimes have to purchase the appropriate technology there. The obsolete equipment of many enterprises, the large number (50 million!) of workers who are involved with unproductive labor, the insufficient production of state-of-the-art computers, rotary lines, robots, etc.--a country with such enormous production, scientific and creative potential cannot tolerate all that any more. In fact, we hold first place in the world in terms of oil production and we smelt as much cast iron and steel as the United States, FRG, Great Britain and France taken together; we have the world's largest machine tool inventory, one-fourth

of all the scientists working on the planet, and in terms of the number of engineers the USSR exceeds the United States by a factor of almost 4.

A great deal has already been said about the reasons for slow scientific and technical progress. And nevertheless, as it appears to me, this problem is being discussed for the time being primarily as a scientific or technical problem, and in the best case as an economic one, whereas long ago it became a social, spiritual and moral one. Nonconsideration of this can nullify the results of many efforts.

The purpose of the present paragraphs is to draw attention to some aspects of the problem of accelerating the development of technology (questions on the progress of science, although closely connected with questions on the development of technology, nevertheless have their own specific character and require independent elucidation) that are seldom broached.

PERSONAL INTEREST IN THE PROGRESS OF TECHNOLOGY

Frequently it's asserted that technical progress proceeds slowly because ingenuous workers and labor collectives aren't interested in it, and attempts at accelerating it "from above" lead to ostentation (for example, a robot is installed that is utilized a total of five percent of the time, or a supposedly new technique--which in fact is inferior to the old one--is created so that production efficiency not only doesn't improve, but even goes down.). If one properly excites the curiosity of a worker or a collective, then the necessity too for intervention "from above" passes and progress quite naturally goes forward with gigantic strides. Is a judgement like this fair?

Ideally technical progress in a society of mature socialism must excite the curiosity of everyone: it makes it possible to increase production, alleviate labor and shorten the working day and, therefore, each one would have to pick up a new idea. In reality, usually its creator has to "breach" a new idea while overcoming the resistance of even those whose job just consists of assisting the innovators. Somebody in one link or another of the "chain" from idea to assimilation wasn't interested in the new item--and the matter was held up.

Reasons for the absence of a personal interest in the progress of technology are varied: there's no desire to work more intensively for the same money, it is terrifying to be left without the usual occupations, one doesn't want to spoil indicators that become worse during the assimilation of new products, and so on. But, however strange, a material incentive system for new items often turns out to be a reason. Here's an example of that.

I've already had to write about Vladimir Alekseyevich Burakov who fought a battle of many years over each of his 24 inventor's certificates for inventions. When Burakov invented a simple method for converting a stake bed truck into a dump truck, the manager of a major motor vehicle transportation enterprise foisted himself upon him as coauthor , promising to rapidly assimilate the new item (in order that they divide the reward in halves), and hinted that there will be no counting on success in case of refusal. But the inventor drove around the motor pool, convinced those who were directly interested in the new

item, and with his own hands re-equipped dozens of the vehicles--and as a result he received his legitimate reward, having provided the state a multimillion ruble savings. But here's a different fate for another idea of Burakov's.

Every railway worker knows how important it is now to automate the uncoupling of railcars at switchyards. The entire shift a worker runs from railcar to railcar, pulls the automatic coupling handles, and--when they get jammed--sets in motion a component inside the wheel track; that is fraught with--especially when there is ice-covered ground or the track is in a state of disrepair--the danger of accidents, and the processing of trains is hampered too. Burakov suggested welding a lever on the automatic coupling head and installing a moving shoe inside the wheel track. When a railcar that is subject to uncoupling passes, the shoe is raised, it presses on the lever and the job is done.

A prototype of the device (an operating model of it was demonstrated at VDNKh [Exhibition of USSR National Economic Achievements]) was tested and showed its effectiveness. But railcar examiner specialists began to push through another device--"although a worse one, indeed one of their own." When their mercenary scheme was exposed, they sent a refinement of Burakov's idea to the institute, having pushed him aside from this matter. There is a misgiving; if only in this case 1 year hadn't been spent on the development of a trivial (from the point of view of costs) device.

There are more striking examples too. One day LITERATURNAYA GAZETA recounted the fact that the Kharkov Electrical Machinery Plant delivered machine units--notorious rejects that they didn't manage to fix even with the labor of hundreds of workers and the cost of outlays worth millions--to the Magnitogorsk Metallurgical Combine. However, the State Emblem of Quality (with an appropriate bonus) was awarded to the machine unit in accordance with Magnitka's presentation. This is already the pursuit not even of a maximum profit, but of a maximum bonus, the conversion of state property into a source of safe personal enrichment, and a method of obtaining money for nothing and for sham technical progress.

As we see, the same reinforcement of material incentive for technical progress doesn't exclude the opposite results too.

THE WAY TO WORLD SUPERIORITY IN TECHNOLOGY

The task of "placing all sectors of the national economy in the foremost advances of science and technology" was set long ago, however, it wasn't solved--as it seems to me--particularly because of the wrong attitude toward using foreign experience.

At the beginning of our country's industrialization, naturally we had to purchase equipment in the developed capitalist countries in order to create our own better equipment according to these models. However, the purchasing of technology and manufacturing methods is practiced rather extensively now too. According to data of the Ministry of Foreign Trade, during the 9th and 10th Five-Year Plans 100 billion rubles of them were purchased. Complete sets of imported equipment for VAZ [Volga Motor Vehicle Plant], KamAZ [Kama Motor Vehicle Plant]

and other major enterprises were purchased on a credit account of capitalist banks. If in this regard there was a calculation on gaining time, then apparently it wasn't entirely justified: when a modernization of VAZ was required, we weren't successful in accomplishing it by ourselves; once again we had to sign a contract with a foreign firm.

While not interfering in the solution of such complex foreign trade problems, I nevertheless can say that the perplexities, which were expressed in the press, of the distinguished brigade leader of pipeline construction workers N. Nezhdanov and of chief scientists of the AN SSSR [USSR Academy of Sciences] Yakutsk Branch N. Cherskiy and Yu. Urzhumtsev as regards the fact that foreign technology is being used so extensively in oil and gas production and coal mining, as well as on construction projects in the country's northern regions, are clear to me.

Of course, the importing of manufacturing methods sometimes makes it possible to retool an enterprise, but frequently it also leads to the negative consequences that were pointed out by Academician N. S. Yenikolopov (IZVESTIYA on 20 May 1984): "It sometimes occurs that we have our own development that is better than the foreign. And the plant director strives with all his might for us to purchase foreign manufacturing methods," because he has an operating factory on his hands and he isn't in a position to be involved in coordinations with domestic authorities and planners that will take several years.

In a series of articles in KOMSOMOLSKAYA PRAVDA the journalist Ye. Losoto exposed the self-conceit of young people "who are into high living" (from the English word "high life" meaning "high living") and who strive to dress only in a "guise"--imported clothes, however, she didn't explain what economic harm "high life" is inflicting on the country, and that's a pity.

Occasionally people who are far more mature, not only in private life but also in the production area, display even more incomprehensible "high life".

One day in one of the newspapers I read that an English company is delivering sound producer consoles for the studios and theaters of Moscow and Leningrad. They say, of course, the "Melodiya" Studio and the Bolshoi Theater must have world class equipment and, naturally, the imported kind. And isn't this the "high life" style?

Well, let's assume, the question concerns high art. But aren't the technical difficulties really insurmountable that have forced us to purchase imported equipment for the production of ordinary brick (incidentally, I'll note that once upon a time Russian brick was highly thought of on the world market) and "Vyatka" washing machines, children's toys and steel rods for oil pumps, blades for safety razors, paper clips and even finished door locks and keys?!

The advantageous conditions of capitalist firms often serve only as a lure. The firms sell by no means the newest technology so that, purchasing it, we only aggravate our own lag. As was correctly noted in one of the press organs, "the need to go to the capitalist market for the newest manufacturing methods and technology is frequently exaggerated, and it's explained by one thing--the

unwillingness to look for internal reserves. The West frequently uses industrial dependence and its own credits for political pressure and for direct and indirect attempts to undermine socialism." Moreover, in this regard we enter into relations with foreign firms on patent and financial matters that frequently prove to be disadvantageous for us. Deals on our part are concluded, one department orders equipment, another installs it, a third builds a frame for it, a fourth operates it, and so forth; each one with its own plans, limits, "weak points" and interests, the coordination of which occasionally is a difficult problem. And naturally the equipment purchased abroad rusts at many enterprises of various industries.

Internationalization of the economy and reinforcement of the interdependence of countries with different socioeconomic systems are typical of the contemporary period in development of the world economic system. Guided by the Leninist concept concerning the peaceful coexistence of two socioeconomic systems and the use of trade as a means for providing normal neighborly relations between people, our country henceforth too will expand mutually beneficial trade relations with socialist, developing and capitalist countries, use the purchases of manufacturing methods and enlist foreign capital to accelerate solution of the problem of developing our own national economy. M. S. Gorbachev spoke about this in his speech at a meeting of the American-Soviet Trade and Economic Council. At the same time, the party points to the necessity of careful justification for each foreign trade deal like this and care of national resources.

According to a valid comment of Scientist N. S. Yenkolopov, the capitalists are trying to sell such manufacturing methods that require the constant delivery of firms' catalysts, reactants and equipment. Knowing that it's difficult to stop an operating factory, then in due course under various pretexts they shamelessly increase the prices for their reactants and spare parts, that is to say, they get an opportunity to rob us in the future too. Sometimes (as happened with the "Ukrkabel" plant which purchased expensive imported equipment in the FRG) for one reason or another we find ourselves unable to provide it with domestic raw material of the necessary quality or to create manufacturing methods of a sufficiently high level.

The importing of technology, when it exceeds a certain level and when--so to speak--"quantity changes to quality," can entail a chain reaction that is undesirable from the point of view of the country's economic independence and about which AN SSSR President and Academician A. P. Aleksandrov recently reminded us too.

In addition, the importation or production of technology according to foreign models hinders the output of distinctively original products that are unique and capable of successfully competing on the world market. And if that's the way you want it, then for importing equipment one has to pay off not so much with finished items as with raw materials--lumber, gas, oil and other nonrenewable natural resources-- (Footnote 1) (More than one-half of Soviet export falls to the lot of fuel and electrical power. "USSR Foreign Trade in 1984," Statistical Collection, Izdatelstvo "Finansy i statistika," Moscow, 1985, p 18) and that, of course, doesn't enrich the country and doesn't promote improving the health of its trade balance and balance of payments. If incentives are absent in

providing for the competitiveness of products on the world market, then it frequently proves to be noncompetitive on the domestic one too; and then, for example, domestic footwear that is even manufactured from natural leather, which is so scarce all over the world, accumulates in warehouses and the public's demand is satisfied by importing.

Press reports of a kind like the following can seldom make some happy too: they purchase tiles for refractory linings for gold, and their own invention that makes it possible to obtain a better product from waste products isn't used. "Balobek" baby food in no way will make its way into production, but a worse product "Similac" is being put on the market in accordance with a license purchased in the United States. Effective installations are created abroad on the basis of a license that is purchased in our country, but now our managers are proposing to purchase them for hard currency.

And look at some construction projects! Some of them resemble a parade of foreign technology. At times it seems that some managers are ready to purchase everything in succession abroad.

At the same time, it's generally known that many kinds of domestic technology don't find a market or they're sold in the form of a "load" for scarcity, they aren't used by consumers, and then are simply sent to scrap metal. Manufacturing unmarketable products and purchasing foreign ones is a pursuit so absurd from the point of view of common sense that sometimes the thought is heard in the press or from the stage as to whether this is the handiwork of agents of foreign monopolies. Of course, this is a cruel joke, but such an immense market as ours is no trifling dream for transnational corporations, especially in light of continuous economic shocks in the West. Cases, when some of our employees who were involved in concluding foreign trade deals waived the country's interests for bribes (IZVESTIYA on 27 November 1983), are particularly an indication of the fact that companies do not disdain to use any means.

It's true, we not only import equipment--we export it too, but basically we sell ordinary machine tools and purchase expensive high-precision ones with computer numerical control (journal of abstracts "Ekonomika promyshlennosti," No 7, 1984).

Of course, foreign trade was and remains a matter for specialists, and all the same each one of us wants it to be mutually beneficial, not be poured out in a loss of hard currency and nonrenewable natural resources, and conducted toward strengthening and not weakening the country's economic independence. For the time being, it seems, the order that the party is calling for in all areas of our life isn't in the named department.

A manager who purchases imported manufacturing methods because a lot of confusion is connected with using domestic ones is essentially operating from capitulatory positions.

And, in my opinion, how important it would be now to explain that the massive acquisition of foreign products and manufacturing methods is not only not a prestigious matter, but it's far from always a patriotic one too. I would

explain that a billion rubles--with the gold content of a ruble being approximately 1 gram (more precisely, 0.987412 grams) ("Soviet Encyclopedic Dictionary," Moscow, 1982, p 1140)--is 1,000 tons of gold (!), which it's necessary to collect at mines not by the tons, but by the grains!

How then to solve the task that was set by the 26th Party Congress and that for the time being is still unfulfilled--constantly overtaking the developed capitalist countries (I recall the popular slogan of the 1930's "overtake and surpass!") or going our own way?

World experience, especially Japanese, shows that the first way is not long-range enough. Thus, for a while the Japanese mastered producing products of firms of the more developed countries and those once again went forward. Having settled only on a course for the modification and improvement of foreign ideas and models on the basis of its own approach, Japan also could achieve a "miracle;" hardly possessing the resources of raw materials and energy, it became a leader of scientific and technical progress in many areas of production.

But there the argument was about leadership in the world of capital and about purely industrial leadership; now we're faced with the question of creating technology of a fundamentally different type that meets the conditions and ideals of a society of developed socialism.

Doctor of Economic Sciences B. Rakitskiy (KOMMUNIST, No 5, 1983) correctly wrote that during the period of building socialism's material and technical base we were forced in many respects to repeat the configuration of technology and manufacturing methods that had taken shape in the developed capitalist countries. The fact that we still haven't completely worked out our own way in the area of technology and manufacturing methods hinders the implementation of socialism's socioeconomic advantages to a certain degree. In fact, a capitalist didn't and can't set such strategic goals before technology and manufacturing methods as their ecological safety, the unrestricted, comprehensive development of workers, and the conversion of labor into the first vital necessity. During a well-known stage socialism was forced to resign itself to the distinctive superiority of technology and economics over socioeconomic problems, and therefore it couldn't capture historical initiative in the area of generating mankind's productive forces. In many respects our society is still determined by the consequences of uncontrolled technical progress, whereas it is within its power for a society of mature socialism to consciously generate the configuration of its own technology on the basis of socioeconomic demands, while building a new channel for the development of technology, manufacturing methods and the organization of production.

K. Marx already established that "capitalist production develops technology and a combination of public production only by such means that at the very same time it undermines the sources of any wealth--the land and the worker" (K. Marx and F. Engels, "Works," 2nd Edition, Vol 23, p 515). Can we create a fundamentally different technology that doesn't undermine these sources, while constantly being equal to the achievements of technical thought of the capitalist countries which is aimed at obtaining instant benefits at the cost of detriment to the basic conditions of mankind's existence? Isn't it time to change the very

criteria for assessing technology, which for the time being in principle remain similar to the ones being used in the capitalist world (comparing versions in terms of the investment recovery period or cited costs)? Is it also important then in an uncritical manner to adopt the Western economic theories of wasteful forced consumption, which they recommend for maintaining the feverishly operating mechanism of capitalist production to more quickly write off and do away with equipment that is still serviceable in order to open the way for expanding capital investments?

What was said doesn't at all mean that there isn't a necessity to update technology and to take into consideration its partial obsolescence. As Doctor of Technical Sciences P. Belyanin correctly asserts, modern technology makes it possible to rapidly and inexpensively reorganize manufacturing methods while not throwing out equipment in this regard, i. e. saving past physical and intellectual labor to the maximum extent possible. Indeed practice has developed many methods for achieving this goal. For example, one can replace the operating units of a machine with more improved outfitting while leaving its serviceable components to serve some more, use to the last screw a combine that is subject to writing off (as leading combine operators do this), and not put it under a press just because a fashionable and adopted theory belonging to the West demands that. In fact, doing away with valuables that are still suitable for use for the sake of clearing a road to new goods only turns the "shaft," the cost indicators, fleeces the consumer and allows a producer to earn bonuses that actually aren't deserved, but it doesn't increase and doesn't even maintain production values. It wasn't by accident that in the CPSU Central Committee decree on "increasing the role of the USSR Academy of Sciences Economics Institute in the development of main questions on the economic theory of developed socialism" it pointed to the necessity for closer coordination of material, physical and cost ratios in development of the national economy.

In short, the statement itself of the problem of technical progress in our country must be different than in the West. With capitalism, where technical progress is torn away from the moral, the essence of it comes down to the fact that a person--while remaining an immoral plunderer--gets even newer opportunities at his disposal to exploit other people and natural resources. It is significant that the production base of the United States, from the ecological point of view, is beneath any criticism whatsoever: over 40 percent of the world's environmental pollution falls to the lot of a country in which only 6 percent of the planet's population resides! And what will become of the globe if other countries overtake the United States tomorrow in this respect? In fact, this will be--so to speak--the end of the world!

In my opinion, it's important to take into consideration even more the fact that technology is not only social, but also national (even under conditions of the increasing internationalization of it) and it bears the imprint of a national storehouse of intellect and the nature of its creator. I had the occasion to speak with specialists who were studying the tank industry of various countries during the World War II period, and they unanimously asserted that the best tank of that time--the T-34--was one of the personifications of indeed a Russian genius. In other countries the tanks were either faster, had more powerful weapons, or more reliable armor, but nowhere else did they succeed in achieving

such an optimum combination of conflicting qualities. I recall an opinion of Gogol about this our national trait: the Russian intellect is an intellect that grasps the "judicious middle, that reconciles the court of arbitration; this is an intellect that knows how to find the legitimate middle of anything."

Of course, the technology created in other countries also bears the imprint of the national storehouse of intellect and character. Thus, Japanese specialists consider the age-old love of the Japanese for miniature things as one of the reasons for the rapid progress of their country in the area of microelectronics. American robots are calculated on a less sustained nature of the worker than the Japanese ones, and so forth. That's why for rapid technical progress it's necessary to rely also on national traditions in technology, while taking into consideration that a country--having achieved superiority--I guess forces other countries to accept the technology created by it for a model.

In my opinion, it's necessary to take all of this into consideration when the high world standard that we want to achieve is being determined. The same alignment toward that which is in the West can turn against us sooner or later. Just as the alignment toward Western models of fashion in light industry for the time being has led inevitably to its always belated penetration to us. Even our Russian women's boots and tanned sheepskin coats that earlier were being ignored then became fashionable after they were appraised in the West.

There's still a small digression on the subject of frivolous fashion. It also has some relationship to technology and manufacturing methods. Recently the "Bolshevichka" factory finally began to turn out quite fashionable clothes, but in accordance with the license of a French firm and on imported equipment. It is difficult to believe that the domestic modellers', sewing industry workers' and machine builders' own devices and capabilities simply weren't sufficient.

The fact that one could name fashion for imported articles of luxury arouses very little sympathy. At one time it used to be that Russian landowners and their wives squandered the income from their estates buying toilet articles and cosmetics in Paris. Not without irony Pushkin depicted worshippers of Western fashion for whom they brought from abroad

EVERYTHING THAT PUNCTILIOUS LONDON
DEALS IN FOR THE HEARTY WHIM
AND ON THE BALTIC WAVES
BRINGS US FOR LUMBER AND FAT,
EVERYTHING THAT IS IN PARIS FOR THE HUNGRY TASTE,
HAVING CHOSEN A USEFUL INDUSTRY,
DEVISED FOR AMUSEMENT,
FOR LUXURY, FOR FASHIONABLE SWEET BLISS.

Gogol, castigating the same servile generation, expressed the hope and confidence that Europe soon will be coming to us not for the purchase of hemp and fat, but for the purchase of wisdom, which they don't sell any more on the European markets. And during the first years of Soviet power, workers who were undernourished and naked wrote to V. I. Lenin that they were willing to endure the hardship several more years, if only Russia weren't sold in a concession to

foreign capital, and the great leader of the revolution highly valued this patriotic feeling of simple laborers. And it's important that nobody ever forgets about this. And that's why we import Egyptian perfume that is manufactured in accordance with a French license and footwear and clothes that are sewn in capitalist countries (incidentally, it must also be said, yielding occasionally to the influence of foreign ideology and unwittingly propagandizing "consumerism". While dealing with drunkeness and smoking, we nevertheless imported alcoholic beverages and tobacco products; moreover, in 1984 we imported more than 1 billion rubles worth of them!

Knowing that through the centuries fashionable women determined development of the economic system to a much greater extent than wise men, and by no means desiring to make a principle of hardship, I nevertheless automatically ask the question: do we really have so little common sense that for the sake of fashionable knickknacks and "saving on troubles" with the setting up of our own production we are willing to squander our labor and nonrenewable natural resources that belong not only to us, but also to our descendants? All the capitalist countries, including the United States, protect their industry from foreign competition with duties. What "gear wheel" in our economic mechanism wore out and began to "spin" and what flaw in our upbringing prevents us from understanding harm from the fact that foreign goods force out and drive domestic ones into a corner?

And there's one more--the diversity of technology and standards.

Once upon a time in our country it was necessary for one to stand in line for a refrigerator, but now they produce 6 million of them per year and they have a great number of brands of them, but unfortunately the components of one won't fit another. It's the same picture with television sets and motor vehicles, manipulators and machine tools with computer numerical control. The diversity of products with capitalism is understandable--managers need not only to satisfy a customer's demand, but also to coerce him toward purchasing components for repair namely at this firm, while increasing its profit--private property hampers standardization. And in our country? Isn't it important here to use the advantage of the socialist economy more fully? Why also produce new, less successful designs whereas, for example, a line is kept for "ZIL" brand refrigerators, which have presented themselves very well previously through the years? In short, one doesn't have to go far for more or less significant examples of the lack of a well thought-out strategy for technical progress.

Technical progress can be real or imaginary. The question of what a higher world standard of technology is seems to be a simple one only on the face of it. In reality, a comparison by no means amounts to comparing indicators of productivity or degree of saving. Just as before the invention of the thermometer one could argue whether a patient had a fever or not, also arguments about the level of technology are possible only before the development of an objective criterion for its effectiveness, which takes into consideration all technical, economic, ecological and social factors.

A typical feature of our time is the fact that, whatever side of the problem of technical progress we take, the matter everywhere rests on the problem of man who truly has now become the "measure of all things."

TECHNOLOGY AND MAN

Marxist-Leninist theory revealed the dialectical interrelationship between technology, a society's social system, and the spiritual and moral development of people. With capitalism the influence of technology on people was dual: while making it possible to achieve an increase in the production of material wealth, at the same time it promoted a degradation of man himself, his running wild intellectually--in the words of K. Marx, and his conversion into a simple machine for the production of surplus value; moreover, both the worker, the capitalist and the bourgeois intellectual are equally mutilated.

Bourgeois scientists and humanists of the 20th century also consider the life of West European--and to an even greater degree American--society to be unnatural. People live not as people, but only like overly busy workers who in their spare time are searching not for knowledge and development, but for primitive amusements. Humaneness is lost under conditions of customary haste, a normal relationship with a human (genuine participation in it) becomes impossible and concedes a place to the relationship as toward a thing and as toward a means for achieving the objective--its own benefit. People are excessively organized and they revere group opinions, and accepted ideas are subject not only to criticism, but also to innocent discussion. As A. Schweitzer wrote in the book "Culture and Ethics" (Russian translation, Moscow, 1973), people are becoming slaves of society, propaganda has taken the place of truth, and belief in truth has been lost; everything is measured not with moral norms, but with benefits and conveniences, and personal morality is sacrificed "on the altar of the mother country,"whereas man must be the force that induces society to strive for perfection.

One of the most important reasons for this degradation and demoralization of bourgeois society is in understanding culture mainly as a certain level of scientific and technical achievement without ethics and spirituality. As a result, the machine has become a much greater idol than a slave for modern Western man--he serves it more than it serves him. Science and technology in the hands of such a savage human is poisoning the seas, rivers and lakes, and even more noticeably they're transforming the world into a desert; and what is more, with their assistance they're influencing the thoughts and soul of modern man, striving to establish control over people and to generate the necessary reflexes among the citizens; and weapons of general destruction have been entrusted to the feeble hands of irresponsible politicians. Physicist Max Born saw the reason for the ailing nature of Western civilization, which led to the appearance of the threat of mankind's destruction with all the might of created technology, precisely "in the destruction of ethical principles that were created through the centuries," in the devaluation of ethics, as well as in the alienation of enormous masses of the population (as a consequence of the deepening division of labor) from genuinely creative activities.

During the postwar period a new stage of the scientific and technical revolution in the developed capitalist countries led to a further increase in the production and consumption of goods, but simultaneously it caused unforeseen changes in people's way of life and morality. The idolization of technical achievements, which exceed all the dreams of visionaries (for example, in Japan they're

working on ideas for transforming all production, management, and people's everyday life on the basis of "artificial intelligence" with fifth generation EVM [computers]), it seems, is a price too high to pay--the disintegration of the national system of life and traditional moral values under the pressure of the pursuit of money and enjoyment and an increase in crime--organized crime in particular--which is promoted also by the mass media with their cult of brutality, violence and pornography. Yes, scientific and technical progress provides even newer means for giving access to the great creations of the human spirit and to the treasures of museums (for example, by means of color television and video films). But under the conditions of low morality, spiritual backwardness of people, and triumphs of a mercenary spirit that permeates the life of a bourgeois society, this hardware is used most often by the vilest tastes by necessity. The accession of the contemporary Western mass culture, an effective tool for fooling people, is connected with it in particular.

To what consequences under these conditions--let's say, in the same Japan--can further technical progress and the assimilation of robots, each of which is capable of replacing dozens of "obsolete" workers and employees, lead? And, as a matter of fact, according to the estimates of scientists, 75 percent of those working will be released from production and services as early as the next few years. Suppose it even succeeds somehow in solving the problem of employing tens of millions of workers who are displaced from production, like the proletariats of ancient Rome it will be necessary to provide them only "bread and entertainment." Those remaining on the job will have to be converted once and for all into a simple appendage of super modern computers in order to sustain competition. What spiritual life will these "new convicts"--or those festive and spiritually underdeveloped people who are released from production, spending their spare time at automatic game machines, in bars, and at television sets and video cassette recorders, and consuming products of the "mass culture"--be capable of? Even today an evening stroll in a central park of Tokyo is far from safe: many Japanese are forced to purchase badges from gangster bands that insure them from the danger of being assaulted and robbed. Within 10-20 years won't the country be transformed into a reign of organized crime and into a society with the unrestricted right of the strong? If even today pollution of the environment has assumed a catastrophic nature, won't the "new society" become a society of inhuman people with whom only a rat, a crow and a dandelion will be able to be neighbors? And if it's yes, then what is the sense in inevitably ongoing technical and industrial progress for which one has to pay such a terrible price? Where is it leading man, the country and mankind to? Today in Japan this horrible prospect has caused a change of public thought toward tradition. The demand for "monitoring the development of science and technology that ignores the interests of mankind" is heard even more persistently there ("Japanese Society and Culture," No 2, Moscow, INION [Scientific Information on Social Sciences Institute], 1984, p 24).

But the progress of technology leaves extremely little time for meditations; it has its own logic of development (K. Marx even spoke about the "self-movement" of technology). Called into being by the demands of people, it often apparently pulls out from under their control and begins to live its own life, compulsorily thrusting its norms on man. For example, the motor vehicle--an invention which once brought joy to people--kills nearly 50,000 people and maims millions

annually in the United States alone, and it poisons the atmosphere. Is this really joy? Haven't we already long ago crossed the boundary of the reasonable, having made it our own idol? And as any idol, an idol demands sacrifices, including bloody ones too, and it draws man along a path about which he didn't even surmise before.

Those who have managed to visit the world exhibition in Tsukube have been able to familiarize themselves with the distinct ideological manifesto of its organizer that is printed in a publicity prospectus: "Technology will become the new deity of mankind" and when this is accomplished, "life will be a continuous holiday."

Of course, to put the blame for the moral and social vices of a bourgeois society on technology would be just as improper as idolizing it. However, the trend of technical progress that has been affirmed in developed capitalist countries in fact remains antihumane. One well-known thought as far back as the ancients, and to which K. Marx attached special importance, proved to be superfluous with capitalism and that is why it's forgotten: the main product of production isn't the item produced, but the person himself of a given society.

Under the pressure of undesirable consequences of these processes foreign specialists even more often are expressing the thought that perfect technology demands a perfect human; moreover, now in a worker it's suggested above all to value honesty, decency, nobleness, conscientiousness, and, it follows, intellect, talent, a high educational and skill level, and even commercial abilities. But from where does one get the perfect human for a society where a mercenary spirit reigns?

The direction and consequences of technical progress in developed capitalist countries set one to thinking about a lot.

Of course, with the absence of private property in our country technical progress can't lead to such catastrophic consequences that are imminent for the capitalist world. However, as B. Rakitskiy correctly noted in the same article in the journal KOMMUNIST, in our country too for the time being technology is still being developed primarily under the influence of economic, and not social, spiritual and moral factors; and that is why, in particular, as before it is counted on for a particular specialization (and then too for a narrowed cultural and world outlook level) of workers, it continues to be an instrument for faster subjugation of nature than alliance with it, and that's why it doesn't consider today's ecological requirements to the proper extent; it's "neutral" with respect to the task of spiritually and morally perfecting man and society. Therefore, technical progress often not only alters the nature of workers' labor, but also their attitude and world outlook, being far from always in a positive direction. Today most of all perhaps this is noticeable in agriculture, although in principle the same phenomena are noted also in other areas of public production.

And, in fact, as far back as over 100 years ago A. N. Engelhardt, the letters of whom (which were highly valued by V. I. Lenin) all of educated Russia--from student to minister--became engrossed in reading at that time, expressed the

thought: "In our country generally too much importance is attached to improving machines and tools, whereas machines are the very last things. Various factors in the economy, in terms of their importance, proceed in a manner like this: first of all the manager because the entire system of the economy depends on him, and, if the system is bad, then no machines whatsoever will help; then the worker because in matters of living the living always have a preponderance over the dead. The economy isn't a factory where a planing machine tool is more important than the human who releases the belt from a pulley — then come machines and tools. But neither machines, nor Simmenthal cattle, nor workers can improve our farms. Only the managers can improve them."

However, subsequently thought about the paramount importance of the human factor in agriculture turned out to be almost forgotten, and until recently the main hopes were placed on further equipping the countryside with technology. But, as it was explained, technology without people who are interested in the health of the land and in the highest yield from it is ineffective, neither does it serve very long.

Technical progress in agriculture was directed toward achieving the greatest efficiency of machinery, but it didn't directly pursue the goal of making the machine operator a corn grower, and this led to radical changes in the worker's world outlook. A corn grower is in fact his own creator, but a creator in alliance with nature; he regulates and directs the living and that's why it is incumbent upon him to have ecological thinking that is integral and encompasses the entire universe (though in the past and not scientific) views on the world and to possess all specialties that are necessary in peasant labor and everyday life. The labor of today's machine operator is also creative, but these are already activities of a different kind, not so much in alliance with nature as in opposition to it, and that gives rise to an entirely different type of consciousness. It's no longer necessary for him daily, in the process of labor, to go deep into the world of complex conformances to the law for development of the living, and occasionally also to peer within himself, the world of technology where iron prevails occupies him more; mechanical dependencies become psychologically more important than the world of living nature and that promotes too the dissemination of more mechanistic notions and an amateurish urban view toward rural life and rural labor (in perspective it's almost toward the simple pressing of buttons). As was expressed in due course, all this has played a noticeably negative role.

Let's say a tractor with a plow is immeasurably more advanced than a wooden plow. But in many areas of the Russian North the fertility of fields dropped precisely with the advent of tractors. The wooden plow was the ideal tool for the nonspreading plowing of a thin, fertile layer of soil (and the horse served not only as a draft force, but also as a producer of the most perfect fertilizer). The powerful tractor frequently plowed the ground at a great depth, turning up the clay that buried the layer of humus under it.

Of course, the tractor in itself wasn't to blame for this, but it's also difficult to blame the tractor driver: he knows the machine, he needs to plow the field somewhat faster, but he isn't trained in the subtleties of handling soil--this is the business of an agronomist.

If the tractor driver about whom the question concerns were not a machine operator-farmer, but a corn grower-machine operator, then probably he would need the tractor too for something entirely different that doesn't compact the soil, but with a set of different tools that make it possible to plow with and without spreading and at a greater or lesser depth depending on the nature of the soil in a given section of the field. Unfortunately, today's tractor and today's machine operator, according to an apt--in my opinion--expression of a certain chief engineer at a kolkhoz, make a pair and one can't exist without the other.

Surely mustn't the very direction of technical progress alert us if, let's say, the humus content in the soil is continuously being reduced simultaneously with the massive assimilation of technology in agriculture in many areas of the country? That is to say, one of the main resources of the people and all of mankind--the fertility of fields--is being made a sacrifice to please instant and mercenary gains; moreover, here and there this process is already beginning to assume a catastrophic nature. Aren't specialists really warning about the harm of an exorbitant increase in the quantity of mineral fertilizers being applied in the soil and the use of pesticides, about the danger of salinization of soils with the introduction of artificial irrigation of fields, and about the threat of soil erosion, which during the last stage isn't connected with the nature of the technology being used? But the attitudes of using the fruits of somebody else's labor and striving "to improve indicators" today at any cost, not thinking about tomorrow, nevertheless remain very viable. Thoughtless trust in technical progress, which in itself supposedly is capable of bringing happiness and well-being to people without moral efforts on their part alas plays a not inconsiderable and by no means positive role in this.

It's impossible to reassure oneself with discussions about the fact that not technology, but the people who use it, are the blame for this. As was stated already, technology isn't something that is neutral toward man, exists alongside him and is independent from him. It is not only a creation of man, but also a distinctive expression of the essence of its own creator. Just as it is possible to judge by the sole bone of a fossilized animal part, its entire organism, technology also provides a notion about the level of man's physical, intellectual, spiritual and moral development during one epoch or another or one socio-economic formation or another. Technology, which undermines the bases of the future well-being and even the very existence of mankind, exposes its creators and users as people who aren't capable of or aren't desirous of peering into the future, people who are selfishly disposed and for the sake of their own profit are able to ignore the interests of subsequent generations.

We quite clearly realize the similar interdependencies of technical and moral progress, when the question concerns the vices of capitalist civilization. Yuriy Bondarev, while reflecting on the ways of development of the West and Russia, noted that with the development of "technical, machine and bourgeois civilization man is being transformed into some greedy consumption machine, while losing his soul and exchanging it for goods and comfort."

Of course, we have other social conditions; indeed until recently people weren't spoiled with an abundance of things. But abundance gradually sets in and confronts people with the "test of being well off," which alas many don't pass, and

a chain of causes and consequences like the following play a not inconsiderable role in this: direction of technical progress--particular specialization of workers--narrowing of their world outlook level--dissemination of mass culture--indifference toward questions of morality--the worst attitude toward labor.

Of course, an increase in the load on 1 milkmaid from 25 to 50 head of cattle with a simultaneous easing of her labor is comprehensive progress. Where 1 milkmaid attends to 50 head, roughly speaking, 49 other women are relieved of the necessity of being in contact with cattle, and they can devote themselves to labor in the service area and in literature, science and management. But, in fact, even more rigid demands in the sense of easing labor arise farther ahead. Who knows, will robot milkmaids perhaps soon make their appearance and for the control of which voice commands will be sufficient? Is there a limit to a similar direction of technical progress? And if man himself is unable to prevent hypodynamia and its harmful consequences, then mustn't technology come to his aid, and isn't it important to create such a technical base of public production that would provide each person the opportunity of combining physical and mental labor with an appropriate comprehensive load that is established in accordance with the scientific norm? Indeed then too some other, for the time being unaccustomed, meaning of the term "scientific and technical progress" as the development of technology for the sake of satisfying a scientifically based demand for labor would appear.

Genuine technical progress ideally is inseparable from improving the health of people's entire life system. If it's aimed at just easing labor in combination with increasing worldly comfort and expanding the production of goods, among many people it inevitably generates a yearning for the easy life, which in turn leads to human degradation. It's noteworthy that the hero of A. P. Chekhov's story "House With an Attic" dreams not only about the even distribution of physical labor among all able-bodied members of society and about the invention of machines, but also about reducing the "number of our demands to a minimum," the tempering of people so they aren't afraid of hunger and cold, and rejecting occupations and promotions that are unnecessary in a healthy society in order to free spare time that can be given to the sciences and the arts and to seeking and striving for truth and the meaning of life. Otherwise a less than happy picture takes shape: "Work is in full swing among scientists, writers and artists, life's comforts increase with each day according to their favor, and demands of the body multiply; meanwhile it's still a long way to truth and as before man remains the most predatory and most unscrupulous animal, and everything is bent toward mankind in its majority degenerating and losing forever any vital capacity." Through the lips of his hero Chekhov emphasized the senselessness of the intelligentsia's labor under conditions when technical progress, as also "the entire intellect and all spiritual energy have been spent on satisfying temporary, transient needs," and aren't directed toward achieving eternal and common goals: "Under conditions like these the life of an artist (I'll risk adding from myself: and of a scientist and engineer as well--MIKHAIL ANTONOV) doesn't make sense, and the more gifted he is the stranger and more incomprehensible is his role, since in fact it turns out that he's working for the amusement of a predatory and unscrupulous animal, while maintaining the existing order."

Technical progress must serve the eminence of the human in man and the harmonious development of the personality in accordance with our ideals, without which it doesn't make sense. The writer Valentin Rasputin formulates his view on this in the following manner: "I believe such a time is coming, and it's already at hand, when people will be forced to agree that careless and unrestrained technical progress doesn't serve man and that it isn't progress." The writer believes that then the wisest people of all nations together will decide what kind of technology they really need, what kind they don't need, and they'll simply destroy everything that is unnecessary. But, in the first place, if blind technical progress without improving man isn't progress at all, then why call a distinctive "technical fever" by a name like this? And, secondly, perhaps instead of destroying what already has been done earlier isn't it better to consciously change the direction of technical progress and place this naturally historical process under the control of society? This will become possible when genuine progress in society--the progress of man himself, his reason, consciousness, heart, an understanding of his human calling, and the establishment of appropriate and reasonable relations with other people and with nature--keeps pace with the progress of technology. If man will progress in this direction, then technology too will become "humanized," promoting the harmonious development of people in harmony with the environment. In fact, the global problems that are common to all mankind are global ones too because they affect every person individually, whereas throughout the world today they still remain the subject of concern of a narrow section of specialists, but the majority of people live and think in categories of day-to-day and this very minute, as if the destinies of the world didn't affect them at all. Meanwhile, under the threat of destruction man is faced for a period of several decades with changing his way of thinking and his attitude toward life and nature, and with understanding his needs to a greater extent than has occurred for many centuries.

The problem concerning the destinies of the planet is an important one for all countries--socialist and capitalist, developed and developing. The problem concerning the moral development of people is a much more urgent one for socialist countries than for the capitalist ones where, in order to resolve it, first it's still necessary to eliminate the social obstacles that are generated by private property. Enormous work faces us in the matter of combining technical and moral progress, because establishing society's control over the development of technology and curbing its uncontrolled progress will require the strenuous effort of spiritual and moral forces and an awakening of the highest qualities of the mind and heart of millions of people.

Attitudes of "technocratic optimism," belief in the fact that scientific and technical progress will lead to the creation of a "postindustrial" society of mass consumption and general well-being (these views found their clearest expression in a book of the "American way of life" apologists G. Kan, U. Brown and L. Mertel "The Next 200 Years. Scenarios for America and the Whole World"), prevailed as far back as 10 years ago in the West. Now scientists like President of the Roman Club A. (Pechchei)-who in his book "Human Qualities" (Russian translation, Moscow, 1980), while warning against the terrible consequences of unbridled technical progress, calls for the rejection of narrow economic views on public production, an improvement in the quality of life and a moral revival of people--are becoming the "rulers of men's minds" of a conscientious share of

the West's intelligentsia. But these desires remain a utopia under the conditions of capitalism.

TECHNICAL PROGRESS AND DISPOSITION OF PRODUCTIVE FORCES

The optimum disposition of productive forces, and particularly of human resources, is one of the conditions for accelerating technical progress.

During the years of Soviet power, the population of the USSR has increased from 163 million to 271.2 million people; moreover, the proportion of urban population rose from 18 to 64 percent. In this regard, nearly two-thirds of the increase in urban population falls to a mechanical increase, i. e. by virtue of the arrival of people from the countryside ("Population of the USSR," Handbook, Moscow, 1983, pp 19, 31). In major cities this increase is explained to a considerable degree by attracting workers "according to a quota" from the countryside to enterprises that are recently under construction, as well as to such types of labor that urban dwellers go to reluctantly. A "quota worker," having worked the prescribed time and received a permanent pass and living space in the city, usually change to a more prestigious job and a new "quota worker" takes his place. For example, the graduates of Leningrad schools as a whole go to VUZ's and tekhnikums, and replenishment of more than half of the working class occurs by virtue of newcomers (among future construction workers there's a total of 5 percent urban dwellers). Large cities are simply growing in spite of a decree about limiting their growth.

An increase in the urban population at the expense of the rural, which was understandable during the years of industrialization, is already causing alarm today. For example, the proportion of urban population in Vladimir Oblast went down to 23 percent and in Ivanovo Oblast down to 19 percent; moreover, a portion of it is employed at enterprises in cities, timber management, etc. and a portion falls to residents of pension age in the countryside. It isn't surprising that a shortage of workers is observed in many kolkhozes and sovkhozes, especially in the nonchernozem area, and frequently there are less tractor operators than tractors in them. According to specialists' estimates, there are 1 million more work places than workers in agriculture. However, it isn't just a matter of a balance of work hands and work places. A person in the countryside not only needs a labor pursuit for a full-blooded life, but also the opportunity of selecting an occupation and the opportunity to have a family, children and conditions for friendly contact and spending spare time in a cultured manner, but this is possible only with sufficient numbers of country population and balancing it according to sex and age (for instance, so that a "bride problem" doesn't occur) and so forth. For the time being these conditions often aren't observed, and that leads to dissatisfaction with life, drunkenness, and a further outflow of people from the countryside.

Although the differences between urban and rural living conditions are gradually being erased, they nevertheless remain substantial in many cases, and both rural and urban residents suffer from them. Many urban dwellers are diverted from nature (according to K. Marx's expression, this "inorganic body of a person"), and they suffer from environmental pollution, exhausting trips on urban transportation, lines in stores, and others. The popularity of gardening

comradeships, which have converted unsuitable areas into flowering gardens, and subsidiary farms of many enterprises speaks about the yearning of many urban dwellers for nature and for labor in the ground. All world experience indicates that the best type of modern housing is a separate, well-built house with all the amenities for a family with a plot of land for relaxation, hobbies and a personal private farm (at least the type of cottage that is built in the small science towns for academicians). But in giant cities it's understandable that houses like these aren't erected because of a shortage of area, and they are rarely built in villages because of a shortage of capital. Urban dwellers who live according to the "work plus television" system aren't socially active enough in terms of their place of residence, and often they don't know their stairway neighbors next to whom they've been living for years.

The conditions that are conducive to harmonious development of the personality aren't in the city as well, inasmuch as the city historically was established as a settlement for particular specialists, whereas formerly in the countryside each peasant was forced to know approximately two dozen occupations.

If technical progress were to proceed immediately at very high rates, this would put large cities in an extremely difficult position: in fact, it is impossible to employ within city boundaries the millions of workers who are released from the production area. Apparently, today such a period has come that was predicted long ago by the classics of Marxism-Leninism and party documents (beginning with the June 1931 decree) of the VKP(b) [All-Union Communist Party (of Bolsheviks)] Central Committee Plenum, when neither rapid technical progress nor full-fledged solution of food and housing problems is possible without disconsolidating large cities and increasing the population density of the countryside. It appears that the time has come to draw practical conclusions from F. Engel's well-known thesis concerning the necessity with socialism "of possibly more uniform distribution of large-scale industry throughout the entire country" and concerning the fact that "civilization has left us such" in the person of large cities "a legacy that will cost a lot of time and efforts to get rid of. But they must be eliminated--and they will be eliminated, even though this is a very long process" (K. Marx and F. Engels, "Works," Vol 20, No 2, p 308)--a thesis with which K. Marx and V. I. Lenin were in agreement. During the industrialization period, the war years and the postwar recovery of the economic system, this thesis wasn't so urgent; now the conditions themselves for further development of productive forces, for which the substantial differences between a giant city and a deserted village are becoming even more of a main obstacle, force one to take it into consideration.

At the end of the 1920's, a lively (or, rather, boisterous) discussion concerning a resettlement system with socialism occurred in our country. The so-called urbanists thought that we must surpass America too in terms of sizes of large cities, and they insisted on the construction of tall communal houses with the complete socialization of everyday life in order to make a sleeping area available to each adult. The disurbanists believed that the city was outdated, and they advocated resettlement in strips along roads, while recommending to make available to each adult a lightweight cabin for lodging that if necessary (for example, when a man and a woman cease living together) would be easy to carry to another place. Apparently then, the theorists' arguments didn't illuminate the

path to practice so much as they confused it, because they occurred on the basis of "leftist" aims (for example, concerning the necessity in every way possible to promote the quickest liquidation of the family) that were condemned in 1930 by a decree of the party's central committee. An understanding of the fact that the best type of housing--a private family residence that gradually became available not only to the rich, but also to many families from the middle classes--had already developed in the world by this time. For example, America--this is a classic country of skyscrapers--became even more "one-story." Even in countries with an extraordinarily high population density (for example, in Belgium) the average number of stories of an urban building remained low. In the West today nobody is surprised that, let's say, a famous Finnish singer--having traveled all over the world on tour--lives on a farm. Since the beginning of the 1970's, the "flight" of residents and industrial enterprises from large cities to the countryside is being noted in the United States (V. S. Pchelintsev, "The Social Structure of Agriculture in the United States and Canada," Moscow, 1984, p 52). We, occupying one-sixth of the land on the planet, are crowded in large cities in a conglomeration of ever higher-storied buildings and only a small portion of the urban dwellers who want them have summer cottages or even garden plots. And here in M. S. Gorbachev's report at the April 1985 Plenum of the CPSU Central Committee it finally talked about the task of providing each family in the future with a separate apartment "or well-built home with all the amenities."

A large city, having been the center of scientific and technical progress for a long time, is now becoming a hindrance to it, but not everybody understands that, and the number of work places in cities is growing faster than the number of workers and that generates undesirable consequences. In the words of the writer Mikhail Alekseyev, "a city is insatiable, they complain to the enterprise director: 'There aren't enough workers.' On one Moscow street alone I counted seven enterprises that require workers 'according to a quota'."

You must admit, technical progress is something strange. With capitalism it leads to release of the work force and to unemployment, and here and there in our country it increases the demand for workers, although economic managers attest that the entire increase in production is obtained by enterprises and industries without the involvement of additional personnel.

And, nevertheless, the times are changing. As a consequence of the demographic situation that has taken shape, during the forthcoming five-year period it is not necessary to count on the large increase in the numbers of workers that has become habitual. On the other hand, the development of industry in the cities is now proceeding more along the way of modernizing existing enterprises than building new ones. Modernization often requires additional areas and there's a terrible shortage of them in a large city. And against our will we'll have to think about siting a portion of the shops in small populated areas. Such large-scale enterprises as ZIL [Motor Vehicle Plant imeni Likhachev] and "Uralmash" have embarked precisely on this path, although not without oversights.

The tendency toward a "change of sign" with population migration and toward the outflow of individual workers and entire industrial projects from the city to the countryside is still weak though, but it has definitely begun to show and,

we hope, the future belongs to it. It's important only not to erect an obstacle in its path, but to find ways to assist its realization.

MANAGING TECHNICAL PROGRESS

A lot of consideration is being given to the scientific organization of managing a technical process, but for the time being practical successes in this area remain modest, and this isn't by accident. In fact, scientific and technical progress isn't only the development of science and technology as such, it entails a transformation of the entire life of people, the organization of their labor and everyday life, standard of comfort and, what is more, their notion concerning the meaning and way of life that is worthy of man. Therefore, today the development of science and technology is an important part of the life of society and social development which, as was shown as long ago as K. Marx, is a "natural historical process" that until recently has occurred basically spontaneously (improvement of the implements of labor, while accumulating, leads to qualitative changes in the entire social superstructure about which people haven't even thought). But spontaneous processes most often develop according to a natural scheme of "conception--growth--flourishing--degradation--death" so that mankind, even if from an instinct of self-preservation, from a certain moment must take the process of all aspects of its own development under its conscious control in order to avoid a tragic outcome. The historical mission and international duty of a society of developed socialism, one might say, consists of this. True, we rarely meditate on similar things inasmuch as because of necessity until recently we had to direct all of our efforts toward solving economic and social problems and providing for independence of the motherland. But the time has come, and the leading country of socialist cooperation has to take on its shoulders too the solution of global problems, on which the future of mankind will depend to a considerable degree.

However, managing technical progress isn't just stating technical problems and monitoring their implementation; with such a narrow understanding of it, it would only lead to formalism, bureaucratism, the distention of states and, in the final analysis, to an inhibiting effect of all this on the development of technology. No, managing the development of technology is first of all managing people, placing high life goals and noble ideals before people, and assisting man in his "humanization" in which K. Marx saw the very essence of progress. In many ways this presupposes a different style of management than heretofore, and places new demands on personnel, especially managerial personnel.

In his report at the 11th Party Congress V. I. Lenin noted that where there is political power and economic strength in the hands of a proletarian state, mainly there isn't enough of a "standard of culture for that section of communists that does the managing" for the transition of Russia to communism. Since then our own intelligentsia has been created in our country and, nevertheless, we're still faced with doing quite a lot for total fulfillment of V. I. Lenin's legacy in this area of life. For the time being,an educated and literate, but ill-bred and uncultured person, a narrow specialist, is a figure who really isn't so rare. In the words of V. I. Lenin, communist managers at the beginning of the 1920's didn't have "sufficient ability to manage," and in many respects this observation remains a correct one in our day too. Why?

First of all, because to manage the national economy and the spiritual life of society means to lead people, and for this it's necessary to know not only technology, manufacturing methods and production economics, but the people themselves too, their heart and soul, their interests and aspirations--both the most down-to-earth ones and the loftiest ones; moreover, in the words of K. Marx, it's necessary "to know what human nature is in general and how it is modified during each given age historically." But similar research still has hardly been conducted in our country, and until recently stating the question on "human nature in general" was rejected from the threshold. In point of fact, studying people and personnel management wasn't included and, indeed one might say, even until now isn't included in the training program of specialists and managers of any level. Today this oversight is being felt by many people. Measures--but indefinite, timid ones--are being suggested for eliminating it. Thus, at the USSR Council of Ministers Academy of the National Economy, in the words of its rector Academician Ye. M. Sergeyev, it's planned to conduct a course in "economic psychology;" that, however, will hardly help the matter, but rather it will promote a distinct revival of the concept of "economic man" who thinks only about his own gain that in due course is disseminated in a vulgar bourgeois political economy. Anyway psychology already has suffered in a way from the intrusion of economic and mechanistic views into it. I think it is necessary for us not "to economize morality," but rather "to moralize economics" and to increase the role of moral principles in all areas of our country's life. That's why many measures conceived for the good of people couldn't provide the expected results that were aimed at upgrading the economic system as such, whereas today it's necessary to set up and improve the entire system of people's life and to improve the socialist system as a whole that has been built already in our country.

Today the task that was set by V. I. Lenin for mastering all those cultural riches which mankind developed on its difficult historical journey--a task that was considered by many economic managers of the old stock as almost a scholastic one and one applying only to the young generation--unexpectedly assumed a special actuality. Now it's required in order for any manager to be able to comprehend explicit and hidden motives, thoughts and actions of people and to raise a collective to great achievements, and for this it's necessary to penetrate into the depths of the human soul. But until now it wasn't so much the scientists (they, according to their own cognition, for the time being know less about it than about the structure of distant stars) who studied the human soul as it was the writers, artists, teachers and thinkers--the founders of grandiose world outlook systems. Mastering these cultural riches would help specialists and managers not only to find sensible ways for solving technical and economic problems, but also to seek out the only correct life position that results from the realization of their own place in the over-all historical and cultural process as links between the past and the future. Without this they will turn out to be not so much managers, who direct the technical process, as its captives and--in the final analysis--victims.

Today a change of criteria for the effectiveness of new technology, a transition from narrow economic assessments (cost savings, recovery of investment periods and so forth) to comprehensive ones that consider social, spiritual, moral and ecological factors, has become necessary for improving management of the

technical process. Then, let's say, it will be necessary first of all to assimilate robots where this will make it possible to eliminate the necessity of involving "quota workers" and where there is a lot of "nonprestigious" manual and semiskilled labor. Each enterprise will be called upon not only to fulfill the production plan (that now serves as the main criterion for assessing its activities), but also to raise the level of its own organization, to reduce harmful effects on people and the environment, and to promote an improvement in its own main product--man--not only as a producer of material wealth, but also of moral substance. In the opinion of LOMO [Leningrad Optical Instrument Association] General Director, Twice Hero of Socialist Labor Mikhail Panfilovich Panfilov, "in due course indeed man, and not production, the worker, and not work, must become the purpose and meaning of labor for each manager. In fact, in the final analysis, a thing isn't the criterion of man, but man is the measure of all things." With an approach like this under the conditions of socialism, the possible undesirable consequences of assimilating new technology and "peopleless" manufacturing methods fall away because they will require tens of millions of new work places in connection with the necessity of complete assimilation and public services and amenities for each area of the country--not only the vast spaces of Siberia and the Far East, but also the immense expanses of the nonchernozem area where for the time being emphasis still has been laid more on increasing production than on reviving nature and restoring the purity of rivers, forests and the fertility of soils, and on creating conditions for a thorough flourishing of people's life and the erection of comfortable and pretty settlements among flowering gardens.

But how occasionally to correctly combine contradictory economic, ecological, social, spiritual and moral criteria? In my opinion, systems theory--a new scientific school of thought that examines integral (systems) entities (the atom, an organism, an enterprise, the national economy, etc.) about which I have already had to write--provides the most suitable tool for this. Not intending to repeat what has already been said and all the more to state here the principles of systems theory, I want to note one aspect of it that makes it especially effective precisely for the purposes of managing social processes, and in particular scientific and technical progress. In contrast to all others, not processes of disintegration (an increase in entropy--according to the second law of thermodynamics), but processes of organization are typical of systems entities; and systems theory is a unique scientific school of thought that provides research methods and qualitative and quantitative assessments of such processes.

Thorough humanization of education for equipping managers, specialists and each laborer not only with special skills, but also with all the riches of culture, turning from the machine to man, equipping the leading authorities of the national economy with an appropriate theory--here are the indispensable conditions that are necessary now for placing management of scientific and technical progress on a truly scientific basis.

The 26th Party Congress emphasized that the infrastructure of the 21st century is now being laid in our country. Let it be not only the most productive and economically sound, but also one that promotes the formation of a person with high spiritual and moral standards. This must become a main requirement too for technical progress. In my opinion, a complex of requirements of that kind

should be incorporated into the draft of our CPSU program that the 27th Party Congress will approve.

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REGIONAL FORMS OF INTERSECTORIAL MANAGEMENT OF S&T PROGRESS

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA EKONOMICHESKAYA in Russian No 1, Jan 86 pp 73-81

[Article by V.G. Shubin: "Problems of the Development of Regional Organizational Forms of the Intersectorial Management of Scientific and Technical Progress"; first paragraph is IZVESTIYA AKADEMII NAUK SSSR. SERIYA EKONOMICHESKAYA introduction; passages within slantlines published in italics]

[Text] The article is devoted to the examination of the questions of the regional approach to the solution of intersectorial problems of the management of scientific and technical activity. In this connection the prospects of the development of various regional management structures, which have appeared in recent times in practice and are aimed at the solution of intersectorial problems of scientific and technical progress, are analyzed. A number of measures on the improvement of the activity of the already established organs of the management of scientific and technical progress and the formation of new ones are proposed.

The ever increasing influence of scientific and technical progress (NTP) on the increase of production efficiency for the accomplishment of the highest goal of socialist society--the meeting of the constantly increasing material and spiritual needs of the working people--is the most important trait of the development of the socialist economy at the present stage. At the April (1985) CPSU Central Committee Plenum the task was posed: by using extensively the achievements of the scientific and technical revolution and bringing the forms of socialist management in line with the present conditions and needs, to achieve the substantial acceleration of socioeconomic progress [1]. The important role of scientific and technical progress in the socioeconomic development of the country was also noted at the June conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress.

As is known, the solution of the indicated problem to a significant degree is governed by the system of the management of scientific and technical progress, which requires its constant improvement for the purpose of satisfying the demands being made on it. The questions of the development, production, and use of scientific and technical innovations are especially difficult, if the

coordination of the activity of organizations of different ministries is required for this (and at present practically no important problem can be solved within a single department). The situation is being aggravated by the fact that the mechanism of the interaction of enterprises of different ministries, on the condition of the absence of a coordinating role of superior organs, is poorly developed. Thus, the task of improving the organizational forms of the intersectorial management of scientific and technical progress is very urgent. Below we will dwell on the questions of the development of several of them.

Great possibilities for the organization of the solution of the intersectorial problems of scientific and technical progress are incorporated in the development of regional management. First, regional management by its content is intersectorial, and territorial organs have specific powers with respect to all the organizations, which are located on this territory and have the most different departmental affiliation. Second, very often the solution of important intersectorial problems of scientific and technical progress can be ensured by the forces of the organizations which are located in one region. For example, such situations are characteristic of large cities, where the concentrations of the scientific and technical potential and the production potential achieve a significant scale. Third, there are strictly regional problems of scientific and technical progress, which are also of an intersectorial nature. The organization of their solution is the prerogative mainly of territorial organs of management.

In recent times many new specific regional forms of the intersectorial management of scientific and technical progress have appeared in practice. They operate at different levels of management (the republic, a set of oblasts, the oblast) and encompass a different number of stages of scientific and technical progress. Developed recently, they nevertheless successfully proved themselves to advantage in practical activity. The following trends of the development of regional organs of the management of scientific and technical progress, which were identified as a result of the analysis, are a prerequisite of the formation of these organizational forms: the active participation of party or state organs in the intersectorial management of scientific and technical progress through a system of organizations, which is specially established under them; the strengthening of the coordinating role of the regional branches (affiliates, centers, departments) of the USSR Academy of Sciences and the academies of sciences of the union republics; the increase of the role of scientific organizations of higher educational institutions as the coordinators and performers of intersectorial research and development in the regions.

Among the regional organizational forms of the intersectorial management of scientific and technical progress, which operate at the republic level, it is possible to name: the commissions for scientific and technical progress, which have been established, for example, under the presidiums of the councils of ministers of the Ukrainian and Belorussian SSR's and are headed by the deputy chairmen of the councils of ministers of these republics; the Georgian SSR State Committee for Science and Technology, the Department of Introduction of the Belorussian SSR Academy of Sciences, which ensures the necessary interdepartmental scientific and technical contacts between academic

institutions and industrial ministries for the purpose of the introduction of important developments of the Belorussian SSR Academy of Sciences in production; the Belorussian Scientific Production Association of Powder Metallurgy (BelNPOPM), which is subordinate to the Belorussian SSR Council of Ministers (the first intersectorial association in our country) and officially carries out the coordination in the republic of all the problems which are connected with powder metallurgy; the Republic Council for the Coordination of Intersectorial Scientific and Technical Problems, which was established under the Moldavian Council of Ministers, and others.

It is possible to group with the various organizational forms, which carry out to some degree the intersectorial management of scientific and technical progress at the level of the large city, such ones as the system of public organs of the management of scientific and technical progress in Kiev, which operates on a pronounced intersectorial basis; the territorial system of the management of scientific and technical progress in Donetsk Oblast, for which the activity of the department of the territorial planning of scientific and technical progress of the oblast planning commission, the Donetsk Scientific Center of the Ukrainian SSR Academy of Sciences, and the Council for the Promotion of the Increase of Production Efficiency, which was formed under the oblast party committee, forms the basis; the Lvov Interdepartmental Special-Purpose Scientific Production Associations (MTsNPO) and Intersectorial Scientific Production Complexes (MNPK). (Footnote 1) (The terminology, which was adopted by the developers of these forms of management in Lvov, is used)

The North Caucasus Scientific Center of the Higher School (SKNTs VSh) is an organization which carries out to a certain degree the intersectorial coordination of scientific and technical activity on the territory of several oblasts of the RSFSR.

We made an attempt to group the named organs by the attribute of the tasks which face them. It turned out that a portion of the organizations is drawn more to activity on the identification of intersectorial scientific and technical problems and the planning of their solution, another portion carries out a larger amount of management functions, engaging not only in the planning, but also in the organization of the implementation of already adopted decisions (plans, programs). However, it is very difficult to draw a clear boundary between them. Perhaps, it is possible to group quite specifically just with planning organizations only the Council for the Acceleration of Scientific and Technical Progress, which operates in Kiev under the city party committee: with the assistance of 17 intersectorial and 5 sectorial commissions it operates at the stage of the study of the possibilities of the use at enterprises of the city of completed developments of Kiev institutes, the accounting of "forgotten" innovations, and the issuing of the corresponding recommendations. In practice the council does not engage in the assurance of the implementation of adopted decisions.

The difficulty of establishing the precise boundary between the groups also stems from the specific nature of each of the named organizations. For example, the Department of Introduction of the Belorussian SSR Academy of Sciences deals with the planning of the introduction at enterprises of the republic of important scientific and technical developments, but ones which

have been completed only at academic institutes. While the Belorussian Scientific Production Association of Powder Metallurgy carries out the full intersectorial management of scientific and technical progress, but only in powder metallurgy.

Therefore, it seems to us, for the identification of the real possibilities of various regional organs in the intersectorial management of scientific and technical activity it is advisable to subdivide them first of all from the standpoint of the official status.

Organizations which have /state status/. These are the State Committee for Science and Technology in Georgia and the Belorussian Scientific Production Association of Powder Metallurgy.

Organizations which carry out the intersectorial coordination of scientific and technical activity as a /voluntary service/. These are the Kiev Council, the Lvov System, which includes the group of intersectorial scientific production complexes and interdepartmental special-purpose scientific production associations, and the North Caucasus Scientific Center of the Higher School.

Organizations which have a /mixed status/. These are the Moldavian Council for the Coordination of Intersectorial Problems of Scientific and Technical Progress and the Donetsk System of the Territorial Management of Scientific and Technical Progress. Their activity is carried out in part on the basis of state (administrative) management and in part as a voluntary service.

There have not been included in this classification the commissions for scientific and technical progress attached to the presidiums of the councils of ministers of the Ukrainian SSR and the Belorussian SSR, since they carry out exclusively the general supervision of scientific and technical progress, as well as the Department of Introduction of the Belorussian SSR Academy of Sciences, since it is engaged in the organization of interdepartmental cooperation only for the academic system.

Let us dwell on the analysis of the activity of the regional forms which express most vividly the specific nature of the indicated groups.

/The Georgian SSR State Committee for Science and Technology/ is called upon to pursue a unified state policy in the area of scientific and technical progress in the republic. Its activity includes in addition to many others the questions connected with the organization of the solution of intersectorial problems of scientific and technical progress. At present Georgia is the only republic, in which a State Committee for Science and Technology exists, which to a large degree is explained by the significant concentration in Georgia of scientific research institutions of republic subordination.

Let us single out the basic directions in the activity of the committee, which characterize precisely the intersectorial management of scientific and technical activity:

--the identification of the most important scientific and technical problems of an intersectorial scale and the formulation of programs for their solution (with the submitting of the corresponding suggestions to the republic Council of Ministers and State Planning Committee);

--the monitoring of the fulfillment of the most important scientific research work and the introduction of scientific and technical achievements at the organizations located on the territory of the republic, regardless of their departmental subordination;

--the examination and correction of the drafts of plans of scientific research work and the use of the achievements of science and technology in the republic, which have been drawn up by organizations of union subordination, which are located in Georgia;

--the adoption of decisions, which are mandatory for ministries, departments, and organizations of the republic, on the suspension of developments which are unjustifiably duplicated;

--the elaboration of proposals on the improvement of the network of scientific organizations, the examination of proposals on the organization of new scientific research institutions and the closing of inefficient ones;

--the special-purpose financing of the most important republic programs;

--the monitoring of the implementation of intersectorial scientific and technical programs of the republic scale;

--the establishment of scientific councils for the most important intersectorial problems of science and technology.

From what has been listed it is evident that the state committee, as it is supposed to, has both official superdepartmental powers and its own resources. It is made up of the chairman, who is appointed by the Georgian SSR Supreme Soviet, deputy chairmen and members of the committee, who are appointed by the Georgian SSR Council of Ministers, including committee members who are leading scientists of the republic and managers of industry and are not on the staff of the system of the committee.

/The organization of the management of scientific and technical progress in the area of powder metallurgy in Belorussia on the basis of the activity of the Belorussian Scientific Production Association of Powder Metallurgy/. The development of scientific research work in powder metallurgy and the organization of the production of items made from metallic powders are a typical intersectorial problem. In Belorussia it received a unique organizational solution. All the rights on the coordination of research and the assurance of joint work on any problems, which are connected with powder metallurgy, are concentrated in one organization--the Belorussian Scientific Production Association of Powder Metallurgy, which is subordinate not to a sectorial ministry, but directly to the Belorussian SSR Council of Ministers (the Department of Science and Technology of the Council of Ministers carries out the specific management of the association).

The joint activity of institutions and enterprises of different departments is carried out within the framework of the comprehensive goal program of the development of powder metallurgy in the republic to 1990, which was formulated by the Belorussian Scientific Production Association of Powder Metallurgy and is monitored by it. It is natural that, by having such significant rights, the association bears full responsibility for the state of affairs in this area of scientific and technical progress.

The Belorussian Scientific Production Association of Powder Metallurgy is also the main organization in the system of the USSR Ministry of Higher and Secondary Specialized Education, which determines its great powers in the coordination of the scientific research of higher educational institutions. The scientific methods supervision of the activity of the association in the area of scientific research and the training and advanced training of specialists is carried out by the Belorussian SSR Ministry of Higher and Secondary Education. The most important tasks facing the Belorussian Scientific Production Association of Powder Metallurgy are:

--the determination of the need of enterprises of the republic for items made of metallic powders and composite materials;

--the organization of their industrial output in conformity with the state plan;

--the conducting of scientific research and development in the area of powder metallurgy;

--the management of the scientific research work being performed in the republic in the area of powder metallurgy and protective coatings;

--the coordination of analogous research in the system of the USSR Ministry of Higher and Secondary Education.

At present there belong to the association: a scientific research institute of powder metallurgy, a special design and technological bureau with a pilot works, an experimental laboratory testing ground, and a plant for the production of items made of metallic powders, which is carried on an independent balance sheet. A general director, who is appointed by the Belorussian SSR Council of Ministers, is in charge of the Belorussian Scientific Production Association of Powder Metallurgy; his deputies are also appointed by the Belorussian SSR Council of Ministers. In necessary cases the influence on republic sectorial scientific research institutes and enterprises is ensured by the promulgation by the general director of the Belorussian Scientific Production Association of Powder Metallurgy of orders and instructions jointly with executives of Belorussian SSR ministries and departments.

Let us now examine the activity of the regional organizations which carry out the interdepartmental management of scientific and technical progress as a voluntary service.

/The organization of the intersectorial management of scientific and technical progress in Lvov Oblast/. Organizational forms of two types: intersectorial complexes and interdepartmental associations, are the basis of the system. Each of the associations belongs to some one specific complex.

Any intersectorial complex is a set of regional scientific and production organizations, which have joined it on a voluntary basis and belong to different departments, but are "close" to each other in the type of activity and the scientific and technical problems being solved. For example, complexes for machine building, instrument making, geology, and others have been established. A collegium, which the Buro of the Lvov Oblast Committee of the Communist Party of the Ukraine approves upon the representation of the Western Scientific Center of the Ukrainian SSR Academy of Sciences, carries out the supervision of such an intersectorial association. The managers of all the organizations, which comprise the complex, leading scientists of the region, and representatives of the oblast party organs belong to the collegium. The chairman of the collegium is the director of the leading scientific research institute of the complex, the deputy chairman is the chief of a department of the oblast party committee.

The scheme of the activity of the complex is as follows. The enterprises, which belong to the intersectorial scientific production complex, regardless of their departmental affiliation submit to the collegium for discussion their own scientific and technical problems. The collegium on the basis of the available scientific reserve and the distribution of the scientific and technical potential draws up a program of actions, which is then approved by the Ukrainian SSR Academy of Sciences and the corresponding ministries.

For the elaboration of several most important and difficult problems the collegium of the intersectorial scientific production complex adopts decisions on the formulation of intersectorial scientific and technical programs, for the implementation of which interdepartmental special-purpose scientific production associations are set up. Usually four or five such associations function within the intersectorial complex; the intersectorial scientific production complex also carries out the coordination of their activity.

The interdepartmental special-purpose scientific production association is, thus, the second component of the regional system of the intersectorial management of scientific and technical progress in the region and also operates as a voluntary service. The supervision of the association is assigned to a management organ which has been specially established for this--the scientific and technical council (NTS), which consists, by analogy with the collegium of the intersectorial scientific production complex, of representatives of the organizations, which are participating in the program, and responsible party officials. Three main organizations, which are responsible for the work at the three major stages of scientific and t nical progress: scientifi esearch, experimental design development, the introduction of completed developments in production, are appointed in each interdepartmental association.

/The organization of the intersectorial management of scientific and technical progress in the North Caucasus Region on the basis of the activity of the

North Caucasus Scientific Center of the Higher School/. The extensive possibilities of science of higher educational institutions in the implementation and coordination of intersectorial research and development were responsible for the appearance in the Northern Caucasus (where a significant portion of the scientific potential is concentrated precisely at higher educational institutions) of such an organizational form as the North Caucasus Scientific Center of the Higher School. This is for the present the only organ of the higher school in the country, which is faced with the task to coordinate the scientific research work being performed by all organizations of the region. Moreover, it (the region) includes such large cities as Rostov, Krasnodar, Stavropol, Groznyy, Ordzhonikidze, and others. In all the North Caucasus Scientific Center of the Higher School coordinates the activity of more than 44 higher educational institutions and 200 sectorial scientific research and design institutions [2].

The management of scientific research and development is carried out mainly as a voluntary service by the center, which performs such functions as the determination of the preferable themes of regional importance for their inclusion by departments in the sectorial plans of scientific and technical progress, the making up of temporary associations of scientific collectives for the solution of regionwide problems, scientific methods supervision, and monitoring. At the same time in some situations the center has the opportunity to promulgate joint orders with sectorial ministries, while with respect to a number of assignments and programs of the RSFSR State Planning Committee and the USSR State Committee for Science and Technology the North Caucasus Scientific Center of the Higher School acts as the main organization for the North Caucasus, which determines the possibilities of the center in the financing of higher educational institutions and scientific research institutes. This enables the North Caucasus Scientific Center of the Higher School to function at the stage of not only the identification of scientific and technical problems and the formulation of intersectorial programs in the region, but also the organization of their fulfillment.

The structure of the center is as follows. The Council of Rectors and Directors of the higher educational institutions and scientific research institutes, which belong to the center, is at the head of it. The established departments and scientific councils coordinate all the operations in the basic directions of science and on the most important problems. Leading scientists are members of them. A number of permanent subdivisions also exist: the scientific organizational department, the department of introduction, the editing and publishing department.

Let us note that at present the establishment of similar regional scientific centers of higher educational institutions is being planned in several other cities: Lvov, Voronezh, Saratov, Gorkiy, Karaganda, and Tomsk (a significant concentration of the potential of higher educational institutions exists in these oblasts).

Let us proceed to the examination of the last regional form of management, which has a "mixed" status.

/The organization of the intersectorial management of scientific and technical progress in Moldavia/. This is the only republic in which an organ for the assurance of the solution of intersectorial scientific and technical problems--the Republic Council for the Coordination of Intersectorial Scientific and Technical Problems--has been established under the council of ministers.

The highest organ of management of the council is its session (it is convened not less than twice a year), between them its presidium carries out the supervision of the activity of the council. In addition to the council members representatives of republic ministries and departments and party and soviet organizations take part in the work of the sessions. The decisions adopted at the session are approved by the Moldavian SSR Council of Ministers, to which the council is directly subordinate. Its decisions are mandatory for all scientific and production organizations of the republic regardless of their departmental affiliation.

The president of the Moldavian SSR Academy of Sciences heads the Presidium of the Republic Council. For the identification and the organization of the solution of specific intersectorial scientific and technical problems (which is the basic direction of the activity of the council) the corresponding scientific councils for problems have been established within the Republic Council. Leading scientists of the republic head them. On the instructions of the council its staff performs direct scientific organizational work. The duties of monitoring the fulfillment of coordinating plans and programs and of preparing the materials necessary for the work of the scientific councils are assigned to this working organ of the council. This subdivision also deals with questions of the coordination of the joint activity of scientific institutions.

The Republic Council, having superdepartmental powers, accumulates all the information which relates to the intersectorial development being carried out, as well as to potential intersectorial development. For this all the scientific research institutes and higher educational institutions submit to the council their plans of work, reports on completed research and the introduction of developments, and proposals on the development of intersectorial operations. On the basis of the available data the council draws up a list of the intersectorial scientific research problems which are to be solved. The main organizations, the coperformers, as well as the base enterprises (introduction should be ensured at them) are specified with respect to them. After coming to an agreement with the Moldavian SSR State Planning Committee the programs are approved by the Moldavian Council of Ministers.

A few words about why the Republic Council has, in our opinion, a "mixed" status, and is not an organ of state management in pure, so to speak, form.

The scientific councils for intersectorial scientific and technical problems, the chairmen of which bear responsibility for the implementation of programs, are the basic structural unit of the council. At the same time the scientific councils operate as a voluntary service. The working organ of the Republic Council, in which the freed staff members are concentrated, has according to

the manning table only seven units, moreover, it is a structural subdivision of the Presidium of the Moldavian SSR Academy of Sciences.

With the examination of the experience of Moldavia we are completing the brief analysis of the activity of several organizational regional forms, which have emerged in our country in recent times and were developed for the intersectorial coordination of scientific and technical activity. It is necessary to emphasize that their appearance reflects the objective need for the increase of the role of the regional aspect in the management of scientific and technical progress.

Let us note that the process of the active establishment of territorial organs of the coordination of scientific and technical activity is occurring in many countries which have a significant scientific and technical potential. For example, in the United States the substantial reorganization of the system of management of science was carried out in the 1960's and 1970's. A law, in accordance with which the government of each state should establish a so-called technical service, the goal of which was the pursuit of a regional scientific and technical policy through special expert groups and institutes, was passed in 1965 [4]. The formation of organs, which manage scientific and technical programs in large cities, was also proposed.

In our country, as has already been noted, diverse practical experience in the development of the territorial management of scientific and technical progress is being gained. Now the task is to determine the prospects of its individual components and to outline possible means of their improvement.

It is very difficult, however, to do this. First, nearly all the forms examined by us are new, moreover, they are the only ones of their kind (with the exception of the Lvov interdepartmental associations and intersectorial complexes, quite a large number of followers of which have appeared in various cities; the Belorussian Scientific Production Association of Powder Metallurgy and the Georgian State Committee for Science and Technology, the North Caucasus Scientific Center of the Higher School, and the council in Moldavia are unique).

Second, the necessary attention was not devoted to scientific research in the area of the regional management of scientific and technical progress, which led to the lag of theory behind practice. Many specialists emphasize this fact (see, for example, [3, 5] and others).

The indicated circumstances do not make it possible to give definitive recommendations on the questions of the development of the regional forms of the management of scientific and technical progress. Nevertheless we will attempt to draw several conclusions.

Great potentials, in our opinion, are incorporated in the development of such republic forms of the intersectorial management of scientific and technical progress as /the Republic Council for the Coordination of Intersectorial Scientific and Technical Problems in Moldavia and the State Committee for Science and Technology in Georgia/. In spite of the fact that the republic state planning committees to a significant degree bear the responsibility for

technical progress, while the deputy chairmen of the councils of ministers of the republics are approved by the managers of the most important programs (for example, in the Ukraine), the need exists for the establishment of state organs which are responsible for the formulation and implementation of intersectorial scientific and technical programs. Precisely such functions have been assigned to the Moldavian Council. Let us merely note the absolute need for the strengthening of the actual status of this organization, for which it is advisable to increase substantially its freed staff and to form a system of responsibility for the results of programs and a system of the material stimulation of the managers of the scientific councils. Here, of course, the council should officially be responsible for all the work and have rights in the management of resources. The question of the legal registration of the powers of the Republic Council with respect to organizations of union subordination also requires its settlement.

In short, it is a question of establishing an effective organ of management, which in its status is similar to the Georgian State Committee for Science and Technology. Taking into account in general the significant increase of the complexity and volume of work on all the problems of the development of science and technology in the republics, the establishment in them of state committees for science and technology might prove to be advisable.

For example, the identification of the possibilities of the joint interdepartmental use of complex scientific equipment, as well as the organization of collective-use instrument centers and their management are one of the problems, which among others the named committees should solve.

/The Belorussian Scientific Production Association of Powder Metallurgy/. The experience of the activity of this intersectorial association clearly showed its great effectiveness. However, a number of questions, which require their settlement, exist.

In particular, it seems to us that such an organization owing to the importance and intersectorial nature of the problem being solved should be not a republic, but an all-union association with regional subdivisions. Let us emphasize that this concerns the future development of the system of intersectorial scientific production associations, at present the status and organization of the activity of the Belorussian Scientific Production Association of Powder Metallurgy are quite apt.

/The intersectorial system of the management of scientific and technical progress in Lvov Oblast/. As is known, this organizational form of management exists as a voluntary service. This circumstance also predetermines the practical possibilities of the Lvov system (they are quite modest). The fact that similar structural formations have already emerged in many large cities (Minsk, Donetsk, Odessa, and others) is explained, perhaps, not by their great efficiency, but by the fact that they are easily established. The voluntary nature of entry into the system and the lack of both administrative and economic levers of influence do not make it possible to regard the Lvov variant as an /independent/ form of the intersectorial management of scientific and technical progress in the region.

Of course, the functioning of intersectorial scientific production complexes and interdepartmental special-purpose scientific production associations yields its own benefits.

First, let us note the possibilities of intersectorial scientific production complexes and interdepartmental special-purpose scientific production associations in the area of information support. The dissemination of not only scientific and technical, but also business (organizational) information is meant. By it there is understood the information which reflects the changes of the scientific and production situation (who is now developing what or is beginning or completing specific jobs, who needs precisely what developments at the given moment). These possibilities are ensured by regular meetings with the participation of all the managers of the organizations which have been united into complexes.

Second, the establishment of permanent personal contacts among the managers of organizations has the result that the sense of personal responsibility is becoming the most important factor of activity.

At the same time the previously named shortcomings are responsible for a certain "fragility" of intersectorial complexes and interdepartmental associations. The principle of voluntary participation in the performance of operations does not always justify itself, and at times leads to the collapse of the organization. That is what happened, for example, with the Spetsmaterialy Interdepartmental Special-Purpose Scientific Production Association, which was established in the Donbass. The director of one of the plants, which belong to the interdepartmental association, to the question of a journalist about the reasons for the nonfulfillment of his own duties, which were assumed within the framework of the functioning of the interdepartmental special-purpose scientific production association, was not even able to understand about what association it was a question. The only thing that he remembered was that he had signed some contract in "a handsome folder" [6]. This case clearly confirms that it is impossible to form the system of the management of an intersectorial program entirely as a voluntary service.

The experience of several oblasts shows that local party organs (oblast committees, city committees) can play a large role in this matter. However, the assignment to them of specific management functions on the organization of the implementation of scientific and technical programs, although it played at this stage a positive role, in principle is inadvisable, since they have their own significantly broader supervisory functions.

Apparently, the problem would receive solution in principle in case of the implementation of the suggestions of N.G. Chumachenko and N.N. Yermoshenko [7] with respect to the formation of scientific and technical administrations (departments) of oblast soviet executive committees and departments of science and technology of oblast planning commissions. Precisely these organs could formulate and monitor the fulfillment of regional programs. Such experience exists, for example, in Donetsk, where the recently established department of the territorial planning of scientific and technical progress of the oblast planning commission is engaging in this work jointly with the Donetsk Scientific Center of the Ukrainian SSR Academy of Sciences. As to such organs

as intersectorial scientific production complexes and interdepartmental special-purpose scientific production associations, they could perform for administrative organs of the management of scientific and technical progress the basic amounts of work on scientific appraisal, the formulation of intersectorial programs, and the preparation of decisions in the area of intersectorial scientific and technical problems.

With respect to several of the largest cities (Moscow, Leningrad, Kiev, and so forth) the suggestion of a number of specialists on the advisability of the formation in them of territorial subdivisions of the USSR State Committee for Science and Technology probably merits attention.

/The North Caucasus Scientific Center of the Higher School/ is operating efficiently as the performer of important intersectorial research and development. As to the function of the intersectorial coordination of scientific and technical activity in the region, it is being performed, as was already indicated, as a voluntary service. It would be possible to achieve its intensification by two measures. First, by giving the sector the rights to the enlistment in its work of organizations which are located on the given territory, regardless of their departmental subordination. Second, by transferring the rights to the distribution of the financial resources which have been allocated by central organs. Let us note, however, that some doubts exist about the advisability of a sectorial organization having such significant administrative and economic powers, especially in case of the establishment in the soviet executive committees of oblasts of subdivisions with similar rights.

In conclusion let us emphasize that in the national economy work has been performed for a long time on the improvement of management on the basis of the interaction of the sectorial and the territorial approaches. The acceleration of the pace of socioeconomic development will depend to a significant extent on the degree of its activeness as applied to the organization of scientific and technical activity.

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OPTIMIZATION OF FORMULATION OF REGIONAL COMPREHENSIVE PROGRAMS

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA EKONOMICHESKAYA in Russian No 1, Jan 86 pp 91-100

[Article by A.D. Bobryshev and A.V. Zhamin: "Means and Methods of the Optimization of the Formulation of Regional Comprehensive Programs of Scientific and Technical Progress"; first paragraph is IZVESTIYA AKADEMII NAUK SSR. SERIYA EKONOMICHESKAYA introduction]

[Text] The results of the formulation of regional comprehensive programs of scientific and technical progress are cited in the article. The problems, the solution of which remains incomplete given the existing approach, are identified. A number of constructive measures, which make it possible to optimize the technique of the formulation of programs and the content of procedures and to ensure the consideration of the assignments of programs in the five-year plans of economic and social development of the region, are proposed. The organizational and economic questions of the participation of local organs of management in this work are examined.

The cardinal acceleration of scientific and technical progress, it was noted in the report of General Secretary of the CPSU Central Committee M.S. Gorbachev at the April (1985) Central Committee Plenum, is the main strategic lever of the intensification of the national economy and the better use of the gained potential [1].

The important role of scientific and technical progress in the socioeconomic development of the country was also emphasized at the June conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress. "It is necessary to make the economy most receptive to scientific and technical progress, to ensure the vital interest in this of all the units of the national economy" [2]. Among the directions on the acceleration of scientific and technical progress a central place is being assigned to the solution of the set of problems of management, and particularly to the elaboration of suggestions on the improvement of the planning of the development of science and technology.

Starting with the 11th Five-Year Plan the Comprehensive Program of USSR Scientific and Technical Progress for 20 Years (KP NTP), which performs the functions of the forecasting, choice, and substantiation of the priority

directions of the development of science and technology and the formation of a reserve of research and development as the base for the making of advanced planning decisions, is the basic document which determines the prospects of the development of scientific and technical progress in the country. In the structure of the program in addition to the sections, which characterize the trends of scientific and technical progress with a breakdown by sectors of the national economy and the most important intersectorial directions, a set of regional programs (RKP NTP) is singled out. The programs of union republics, the Central Economic Region of the RSFSR, Moscow, Moscow Oblast, and Leningrad and the oblast are among them.

The treatments of the question of the basic purpose and specific nature of the regional comprehensive program of scientific and technical progress, which are encountered in the literature, as a rule, are uniform with respect to a number of fundamental features. What is meant is, first, the preplanning, recommendary nature of the document. Second, the need for the reflection in it of the long-range directions of scientific and technical progress at enterprises and organizations of the region. Third, the existence of a close interconnection with the sections of the all-union Comprehensive Program of Scientific and Technical Progress. However, for the most part the unity of views ends at this. In practice there are advanced as the main goals of the regional comprehensive program of scientific and technical progress the development of the scientific and technical specialization of the region, which ensures the increase of its contribution to the national economy of the country; the assurance of the meeting of the increasing needs of the population of the region, the increase of the standard of living, the elimination of the intraregional differences with respect to these indicators; the increase of the quality of the environment and the improvement of the demographic situation; the increase of the efficiency of the use of all the resources of the region; the improvement of the structure of the economy of the region, the assurance of its comprehensive and balanced development, and others.

As is evident, a unified point of view on this most important question is lacking, meanwhile the efficiency organization of all the further work on the preparation of programs depends on its proper settlement.

Without going into a detailed analysis of the cited formulas, let us note that the approach to the determination of the main goal of the regional comprehensive program of scientific and technical progress, which is based on the consideration of the need for the solution of a set of problems of different levels, is, in our opinion, most acceptable. Among them are: the determination of the priority directions of scientific and technical progress for the region; the analysis of the possibilities and the efficiency of the use of the set of regional factors of the acceleration of scientific and technical progress; the identification and evaluation of the influence of the basic regional limitations with respect to the directions and scale of the introduction of the achievements of scientific and technical progress.

The advisability of such an approach stems from the increase during the past decade of the role of regions in the implementation of the unified scientific and technical policy. On the one hand, this is the activity on the

fulfillment of the functions of the region, which stem from the all-union division of labor, and, on the other, the assurance of the most complete solution possible of the local problems of the development of science and technology in the sphere of economics, ecology, urban development, the social sphere, and others.

The problems, for the solution of which regional comprehensive programs of scientific and technical progress are formulated, determine the composition and structure of their sections. Thus, for example, the Comprehensive Program of Scientific and Technical Progress in the Donbass for 1985-2005 includes the following sections: the scientific and technical orientation of the national economic complex of the region (the consolidated section); the development and distribution of the scientific and technical potential; the basic directions of scientific and technical progress in the sectors of the national economy; the regional intersectorial problems of scientific and technical progress; the socioeconomic consequences of scientific and technical progress in the region [4]. When preparing the Comprehensive Program of Scientific and Technical Progress of Moscow to 2005 it was deemed advisable to form six sections which reflect the most important aspects of the scientific and technical progress of the development of the city. These are the consolidated section "The Development of the National Economy of Moscow to 2005 and Scientific and Technical Progress," as well as the sections: "The Development of Science," "Scientific and Technical Progress in Industry of Moscow," "Scientific and Technical Progress in Municipal Services," "Scientific and Technical Progress in the General Power System of Moscow," "The Socioeconomic Consequences of Scientific and Technical Progress in Moscow."

One of the most carefully prepared sections, which have been developed at present by the regional comprehensive programs of scientific and technical progress, is "Industry." It is of particular importance in the comprehensive programs of scientific and technical progress of the largest cities of the country. This is explained by the high concentration of the technical potential on a limited territory, which, on the one hand, raises the problem of the intensification of its use for the purpose of solving all-union problems and, on the other, by having an active influence on the habitat and on the solution of the problems of the development of the social and production infrastructure, requires the elaboration of the corresponding measures on the elimination of the possible negative consequences of this influence.

An attempt to take into account the need for the solution of the listed problems is made in the sections devoted to scientific and technical progress in industry of a number of regional comprehensive programs of scientific and technical progress. A careful comprehensive analysis of the level of the scientific and technical development of the enterprises of the city is made, on this basis the prospects of scientific and technical progress are determined with respect to such most important problems as: the development and assimilation of new technologies; the development of equipment, which ensures the decrease of the labor intensiveness of the output being produced by the mechanization of production, the automation of technological processes, the use of manipulators and robotics; the development and introduction in production of new types of raw materials and materials; the enlargement of the

assortment and the improvement of the quality of products with the simultaneous decrease of their materials-output and power-output ratios; the increase of the output of technically complex consumer goods. The directions of the improvement of the sectorial structure of industry of the region are examined. In addition to the materials of the section "Industry" problem sections, in which, in particular, there are formulated a number of most important sectorial scientific and technical problems, with respect to which the formulation of scientific and technical programs in industry of the regions is proposed, were prepared in the consolidated volumes of the regional comprehensive programs of scientific and technical progress.

In the Comprehensive Program of Scientific and Technical Progress of Moscow to 2005 the determination of the trends and parameters of scientific and technical progress by sets of interconnected sectors: chemical and petrochemical, food, machine building, and others, seems apt. Such an approach makes it possible to take into account the intersectorial interrelations with respect to the consumption of a specific range of resources of the region, the satisfaction of the mutual needs of sectors for the achievements of scientific and technical progress, and others. This is all the more urgent under present conditions, when the question of establishing organs of the management of large national economic complexes is being placed on the agenda [2, p 24].

Along with the materials, which characterize the trends of scientific and technical progress in sectorial complexes, the results of the analysis of the state and prospects of individual most important directions of scientific and technical progress are cited in the program. This makes it possible, by diverting attention from the unique features of the development of science and technology in specific sectors, to trace the general laws of scientific and technical progress in the region and to evaluate the degree of their conformity to the all-union trends.

At the same time, without denying the unquestionable value of such materials, which describe in detail the prospects of the development of scientific and technical progress in regions for a 20-year period, it is necessary to note the existence of individual difficult problems, which it was not possible to solve in the process of preparing the regional comprehensive programs of scientific and technical progress. As a whole they stem from the inadequate, in our opinion, procedural support of the work on the formulation of the programs, the poor substantiation of the logic and procedures of the fulfillment of the stages of this work, and the one-sided approach to the study of the questions of the preplanning elaborations of scientific and technical progress in the regions, which are limited to the examination of only one of the functions of the management of complex socioeconomic processes, namely planning. Let us direct attention to several of the most important, in our opinion, named problems.

First, this is the inadequate soundness of the sections of the programs. The questions of the development of the production infrastructure of industry and ancillary production slipped almost entirely from the field of view, for example, of the developers. At the same time the task of ensuring the comprehensiveness of the determination of the prospects of scientific and

technical progress in the region dictates the need for the consideration of not only the entire set of subdivisions of social production, but also the specific nature of the development of their individual components with respect to the characteristic indicators. Moreover, the inclusion within the section "Industry" of the regional comprehensive program of scientific and technical progress of information on the prospects of the development of the social production block of the production infrastructure (Footnote 1) (Within the production infrastructure of industry we distinguish the blocks: the social production block (production scientific research, the training of personnel on the job, labor safety procedures, nature conservation objects, and others) and the technical organizational block (transportation and communications, production engineering management, power facilities, and others)) will directly ensure the consideration in the program of the social component of scientific and technical progress in industry of the region.

The reasons for the formed situation, so it seems, consist in the inadequate structurization of the main goals of the comprehensive program of scientific and technical progress, their disintegration to the level of the basic unit, the lack of qualitative and quantitative substantiations of the advisability of implementing the forecast measures for the achievement of the ultimate goal, and a certain limitedness of the approach to the formulation of the regional comprehensive program of scientific and technical progress mainly on the basis of the information of the prevailing forms of statistical reporting.

Second, the question of the further fate of the estimates of the basic indicators of scientific and technical progress, which are contained in the programs, remains not completely studied. For the present it is not completely clear how these estimates will be transformed into plan assignments. The logic of national economic planning: "comprehensive program of scientific and technical progress--basic directions--control figures--five-year plan," which was legitimized by the decree of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" of 12 July 1979, requires in each specific case the development of additional procedural support.

Third, both territorial plans and the known regional comprehensive programs of scientific and technical progress continue to be formulated as a simple summary of the planning and forecasting information, which is submitted by ministries and departments to local organs of management or the main organization for the program. This circumstance along with others makes it possible to question the validity and viability of documents of this sort. In this connection the introduction in the practice of formulating regional comprehensive programs of scientific and technical progress of the procedures of the comprehensive economic analysis of the target indicators of the development of scientific and technical progress in the sectors of the economy of the region is an objective necessity.

And a final thing. The tasks and functions of the organs of the management of the comprehensive program and of the territorial administrative and economic staff in case of the formulation, the organization of the fulfillment, the monitoring, and the coordination of the progress of the work on regional

comprehensive programs of scientific and technical progress should be defined more precisely for the purpose of ensuring the practicability of regional comprehensive programs of scientific and technical progress.

The solution of the listed problems, in our opinion, will occur when fulfilling the next set of operations.

The precise structurization of the main goal of the regional comprehensive program of scientific and technical progress, of which the specific directions of the work of scientific organizations, enterprises, and associations, which encompass all aspects of scientific and technical activity (including the problems of the development of the production infrastructure and ancillary production) at all stages of the research-production cycle, will constitute the lower level, is, in our opinion, the initial and a mandatory condition, the observance of which will ensure the soundness of the composition and content of the sections of the Comprehensive Program of Scientific and Technical Progress in the region. The solution of this problem is possible with the use of the well-known apparatus of the construction of "a tree of goals" and should be carried out at each stage of the specification of the Comprehensive Program. (Footnote 2) (In conformity with the indicated decree of the CPSU Central Committee and the USSR Council of Ministers, the comprehensive program of scientific and technical progress is revised once every 5 years and is approved 2 years before the start of the five-year plan) The implementation of the named procedure will make it possible, first, to coordinate the goals of each of the sections with the main goal of the regional comprehensive program of scientific and technical progress; second, to ensure the complete encompassing of the factors which have an influence on the process of achieving the main goal of the program; third, to substantiate the set of information, which is requested by the main organization from the performers; and, fourth, to specify the directions of the analysis of this information.

However, it is necessary to emphasize that the formulations of the main goals of the regional comprehensive programs of scientific and technical progress, which are known to us, do not make it possible at present to perform this work at a sufficiently high level due to their lack of specificity and the absence of any quantitative characteristics. In this connection the opinion concerning the advancement as the main goal of the regional comprehensive program of scientific and technical progress of the assurance of the growth rate of labor productivity, which has been prescribed for the long-range future, and accordingly the growth rate of production, the increase of the efficiency of the economy, and the increase of the amount of national income merits special attention [5]. The legitimacy of such a formulation, in our opinion, stems from the fact that the task of "the substantial acceleration of socioeconomic progress" first of all on the basis of "the scientific and technical updating of production and the achievement of the highest world level of labor productivity" [1, pp 8,7] is now the key problem of the development of the country.

The establishment of the above-named task as the main goal of the regional comprehensive program of scientific and technical progress will make it possible to actually carry out its structural analysis, having thereby ensured

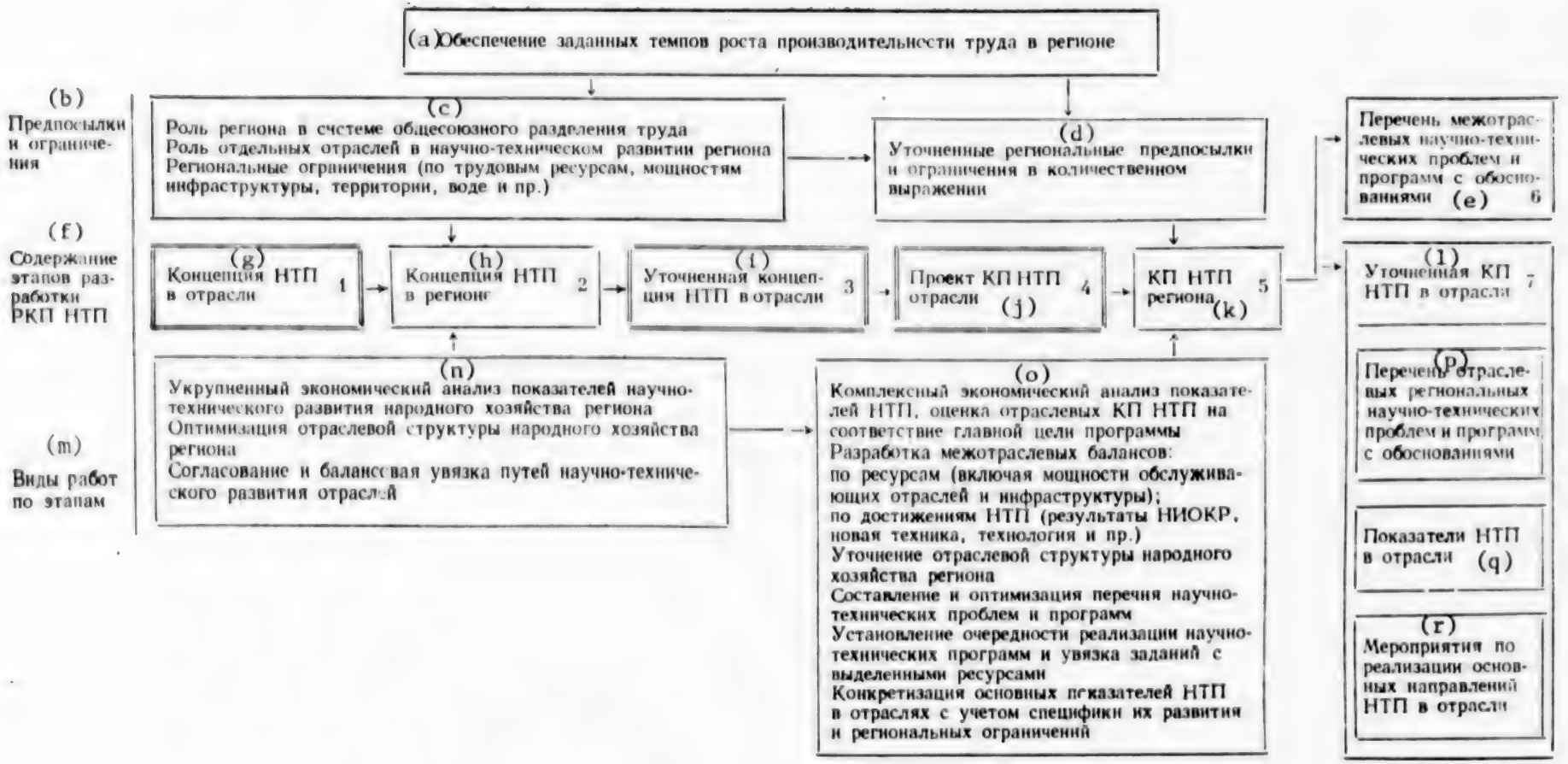
the reducibility of the scientifically sound measures of scientific and technical progress, which are envisaged for the future by enterprises and organizations of the region; will create the prerequisites for the formation of a list of the most important intersectorial and sectorial scientific and technical problems, which have been specified not only qualitatively, but also quantitatively; will make it possible to efficiently monitor the progress of the fulfillment of the program.

The second problem--the establishment of the interconnection of the regional comprehensive program of scientific and technical progress with the plans of organizations and enterprises, as well as with the territorial plans--so it seems, can be solved in case of the fulfillment of the conditions of the complete continuity of the indicators of the regional comprehensive program of scientific and technical progress, the suggestions for the Basic Directions of Economic and Social Development, and the five-year plans of organizations and enterprises. This thesis is finding its reflection in part in the regional comprehensive programs of scientific and technical progress, which are being formulated. Thus, among the basic indicators, which describe the prospect of the development of Moscow enterprises and organizations, there are: the level of the mechanization and automation of production and labor productivity; the proportion of products of the highest quality category; the volume of commodity production; capital investments (including for renovation and retooling, expansion and new construction); the average annual value of the fixed production capital; the use of the territory; the consumption of water, fuel and energy resources, and electric power. These indicators are also the most important ones when planning for a 5-year period. (Footnote 3) (Here it is necessary to note that it is possible to characterize the listed indicators in their majority only on first approximation as indicators of scientific and technical progress. The further specification of their composition within the solution of such a difficult problem as the development of a set of indicators of scientific and technical progress in the national economy, work on which is being performed at a number of leading economic institutes of the country, is required)

At the same time, for example, the content of the sections "The Most Important Scientific and Technical Problems" of the regional comprehensive program of scientific and technical progress does not make it possible to trace the logic of the accomplishment of the problems listed in it once again owing to the lack of specificity of the formulations and the absence of quantitative characteristics of the assignments (the estimated cost, the time, capital investments, the need for manpower resources, and others).

In this connection one should assume to be advisable the making of a dummy copy of the comprehensive program on the basis of the information of the forms of the USSR State Planning Committee by the corresponding sections. Here a certain consolidation of the submitted information and the lack of detailing of the indicators are inevitable. However, at the stage of long-range planning this is also not required. The directions of scientific and technical progress will undergo more detailed analysis at the subsequent stages of planning.

Diagram 1. Technique of the Formulation of Regional Comprehensive Programs of Scientific and Technical Progress



Key:

a. Assurance of the given growth rate of labor productivity in the region
b. Prerequities and limitations
c. Role of the region in the all-union division of labor. Role of individual sectors in the scientific and technical development of the region. Regional limitations (with respect to manpower resources, the capacities of the infrastructure, territory, water, and others)
d. Specified regional prerequisites and limitations in quantitative terms
e. List of intersectorial scientific and technical problems and programs with substantiations
f. Content of the stages of the formation of the regional comprehensive program of scientific and technical progress
g. Concept of scientific and technical progress in the sector
h. Concept of scientific and technical progress in the region
i. Specified concept of scientific and technical progress in the sector
j. Draft of the comprehensive program of scientific and technical progress in the sector
k. Comprehensive program of scientific and technical progress of the region
l. Specified comprehensive program of scientific and technical progress in the sector
m. Types of operations by stages
n. Consolidated economic analysis of the indicators of the scientific and technical development of the national economy of the region. Optimization of the sectorial structure of the national economy of the region. The matching and balance sheet coordination of the means of the scientific and technical development of sectors.
o. Comprehensive economic analysis of the indicators of scientific and technical progress, the evaluation of the sectorial comprehensive programs of scientific and technical progress for conformity to the main goal of the program. The elaboration of intersectorial balances: with respect to resources (including the capacities of the service sectors and the infrastructure); with respect to the achievements of scientific and technical progress (the results of research and development, new equipment, technology, and others). The specification of the sectorial structure of the national economy of the region. The compilation and optimization of a list of scientific and technical problems and programs. The establishment of the sequence of the implementation of scientific and technical programs and the coordination of the assignments with the allocated resources. The specification of the basic indicators of scientific and technical progress in the sectors with allowance made for the specific nature of their development and the regional limitations.
p. List of sectorial regional scientific and technical problems and programs with substantiations
q. Indicators of scientific and technical progress in the sector
r. Measures on the implementation of the basic directions of scientific and technical progress in the sector

Thus, taking as a basis the need for the solution of the problems listed above, as well as taking into account the examined directions of their solution, it is possible to propose the following logic and content of the procedures of the formulation of the regional comprehensive program of scientific and technical progress (diagram).

On the basis of the assignments on the increase of the productivity of national labor in the region, which have been established for the region, as well as the forecasts of the scientific and technical development of sectorial complexes, the main organizations of ministries and departments elaborate and submit to the main organization for the program the concepts of scientific and technical progress in their sectors (block 1). This document, which characterizes the most general directions of scientific and technical progress, includes: the specification of the main task of the period being forecast, the evaluation of the resources of the sector and the means of increasing their use, the establishment of the priorities and most important proportions in the development of science and technology. The qualitative and consolidated quantitative characterization of the most important directions of scientific and technical progress in the sector, the basic parameters of the technical level of production, and the resource limitations with respect to the development of enterprises and organizations find reflection in the concept.

The main organization when processing the received materials directs its attention to the consideration of a number of provisions which characterize the specific nature of each concrete region. We group with them: the role of the region in the system of the all-union division of labor; the role of individual sectors in the scientific and technical development of the region; the regional limitations (with respect to manpower resources, the capacities of the infrastructure, the use of the territory, the consumption of water, and others). Guided by the instructions on the named group of provisions, the main organization carries out the formulation of the concept of scientific and technical progress in the region as a whole (block 2). In this case work should be performed in the following basic directions.

1. /The consolidated economic analysis of the indicators of the scientific and technical development of the sectors of the national economy of the region/. The advisability of making the analysis was substantiated by us earlier. Its content at the stage of the elaboration of the concept, in our opinion, should reduce, first, to the evaluation of the results of the implementation of the comprehensive program during the preceding 5 years (which at present is not being done), which will make it possible to determine the trends of scientific and technical progress, which developed during the 5-year period, and the dynamics of the basic indicators of scientific and technical development, to verify the soundness and advisability of the measures planned for implementation, and to prepare the base for the comparison and evaluation of the dynamics of the indicators being forecast.

The determination of the conformity of the provisions of the concept to the resources of the territory and the set of regional limitations is an important component of the procedure of the consolidated economic analysis. Moreover, two groups of resources should be distinguished: sectorial resources (raw

materials, materials, finances, the capacities of the production infrastructure, and others) and territorial resources (manpower resources, territory, water, the capacities of the production infrastructure of the region, and others). The consideration of this circumstance is necessary when preparing address proposals on the revised concepts of scientific and technical progress in the sector.

The analysis of the efficiency of the use of the resources, which are being allocated for the implementation of the basic directions of scientific and technical progress, is the third component of the direction of work under consideration. In accordance with the results of the evaluation of the dynamics of such indicators as the specific power-output, fuel-output, and electric power-output ratios, labor productivity, the output-capital ratio, and others, the main organization prepares recommendations on the specification of the aims of the sectorial concepts of scientific and technical progress.

A comprehensive evaluation of the conformity of the provisions of the concept of scientific and technical progress to the main goal of the program is given on the basis of the obtained information.

2. /The optimization of the sectorial structure of the national economy of the region/. The need for the establishment of efficient proportions in the development of the sectorial scientific and technical complexes of the region forms under the influence of external factors, which govern regional development and were formulated by us above. On the basis of the growth rate of labor productivity and the resource limitations, which have been established for the region, the main organization carries out the adjustment of the provisions of the sectorial concepts with respect to such most important parameters as manpower resources, fixed capital, the volumes and range of output being produced, the occupied territory, and the consumption of water, fuel, and energy resources.

3. /The matching and balance sheet coordination of the means of the scientific and technical development of sectors/. The tasks of the main organization when carrying out this procedure are: the analysis of the mutual needs of the sectors for the use of the achievements of scientific and technical progress, the elimination of the duplication of research and development of the same type, the formulation of the intersectorial problems of the scientific and technical development of the region, and others. The preparation of the procedural support of this work requires the corresponding specification of the forms of documentation, which is requested by the main organization for the program from the sectors.

The specified concept (block 3), the content of which is brought to the notice of the main organizations in the sectors, will constitute the result of the work of the main organization at the stage in question. When formulating the known regional comprehensive programs of scientific and technical progress documents of this sort were not prepared. Thereby, starting with the first stages of the formulation of the programs, the prospects of the scientific and technical development of the region turned out not to be coordinated with its resources. Owing to the lack of feedback between the main organizations for

the programs as a whole and the sectorial main institutes it was not possible to bring the sectorial forecasts of scientific and technical progress in line in good time with the tasks of the economic and social development of the region, which, of course, decreased the reliability and practical importance of the information presented in the programs.

Having adjusted the prospects of the scientific and technical development of their sectors in conformity with the specified concept, the main organizations develop detailed drafts of the sectorial regional comprehensive programs of scientific and technical progress (block 4) and submit them to the main organization for the program as a whole.

At the stage of the formulation of the regional comprehensive program the main organization proceeds from the same prerequisites as in case of the drawing up of the concept, but which have already received their specification and quantitative expression. In addition to the adding up and generalization of the indicators of the sectorial comprehensive programs of scientific and technical progress work, which is similar to the work performed at the stage of the preparation of the concept, is carried out. The differences consist merely in the depth and specification of the analysis of the questions.

Thus, such specific estimated indicators as the decrease of the number of workers by means of the introduction of the achievements of scientific and technical progress, the increase of the production volumes and labor productivity, the decrease of the cost of commodity production due to the effect of this factor, and others are used when carrying out the procedure which we call "The Comprehensive Economic Analysis of the Indicators of Scientific and Technical Progress and the Evaluation of the Sectorial Comprehensive Programs of Scientific and Technical Progress for Conformity to the Main Goal of the Program." Their use will make it possible with a high degree of soundness to give a characterization of the prospects of the scientific and technical development of the sectors and to prepare the base for the solution of the problems of this stage.

The set of operations on the compiling of intersectorial balances in two basic directions is closely connected with the content of the procedure of economic analysis. On the one hand, this is the consumed resources and, on the other, the achievements of scientific and technical progress (including the results of research and development, new equipment, technology, and others).

The making of balance calculations of the indicators of the program and their coordination with the regional limitations, so it seems, will give scientific soundness to the recommendations of the comprehensive program of scientific and technical progress and will increase sharply the reliability of the forecast part of the program. The fulfillment of this procedure will make available along with others to local organs of management a real basis for the coordination of the development of science and technology in sectorial scientific production complexes of the region and will be a practical expression of the theoretical approach to the national economy of the region as a complex economic system.

The content of the work at the stage of the compiling and optimization of the list of scientific and technical problems and programs requires some revision. Two different points of view on this question exist in the economic literature. The first substantiates the need for the elaboration within the regional comprehensive program of scientific and technical progress of a list of the most important scientific and technical problems and drafts of goal programs on the solution of several of them. The second, which is closest to us, envisages the formulation within the program of a list of the most important scientific and technical problems with substantiations. The formulation of goal programs, which will be carried out, however, after the approval of the regional comprehensive program of scientific and technical progress, is possible for their realization. By what is this point of view substantiated? First, the prevailing logic of national economic planning precludes in advance the possibility of formulating goal programs within the regional comprehensive program of scientific and technical progress. And here is why. When drawing up the drafts of sectorial comprehensive programs of scientific and technical progress the main organizations for the most part do not have information on the possibility of the intersectorial coordination of research and development owing to the lack of sound and coordinated forecasts of the scientific and technical development of related sectors. At the same time the compiling of goal programs on the accomplishment of scientific and technical problems first of all requires the organization of the intersectorial interaction of institutes and enterprises of different departmental subordination. At the stage of the formulation of the comprehensive program of scientific and technical progress it does not seem possible to do this. Second, the drawing up of drafts of scientific and technical goal programs within the regional comprehensive program of scientific and technical progress is inadvisable for the following reason. The number of programs and the amounts of resources, which are necessary for their implementation, will obviously exceed the possibilities of the scientific and technical potential of the region for the future period being forecast. The start of the fulfillment of this portion of the programs in this connection will be postponed for an indefinite time, during which the conditions of the supply of resources and the importance of some problems or others can undergo appreciable changes and fundamentally new scientific and technical solutions, which remove from the agenda the problems which were formulated in the regional comprehensive program of scientific and technical progress as the most important ones, can emerge.

Therefore, the formulation within the regional comprehensive program of scientific and technical progress only of a list of scientific and technical problems with the necessary technical and economic substantiations seems to be the only reasonable thing.

The work on the identification of the most important, priority tasks, the establishment of the sequence of their accomplishment, and coordination with the available resources will constitute the content of the next stage of the process of formulating the regional comprehensive program of scientific and technical progress.

Thus, the fulfillment of the examined group of operations will make it possible as a result to obtain a balanced, scientifically sound document,

which is coordinated with the set of regional limitations and specifies the prospects of the scientific and technical development of the region for a 20-year period. It is possible to distinguish in it two large blocks. These are the list of intersectorial scientific and technical problems and programs with substantiations (block 6), as well as the set of specified regional sectorial comprehensive programs of scientific and technical progress (block 7).

The examined technique of formulating the regional comprehensive program of scientific and technical progress is not something entirely original. Individual components of it are already being used in the practice of preparing documents of this sort [6]. However, the content of the procedures of processing the information, which is received from sectorial institutes by the main organization, requires it further development and specification in conformity with the stated directions.

The monitoring of the coordination of the assignments of the regional comprehensive program of scientific and technical progress with the five-year plans of the enterprises and organizations of the region is the last of the most important, in our opinion, problems of formulating regional comprehensive programs of scientific and technical progress, as well as the basic condition of their practicability. As is believed, the directives of the regional comprehensive program of scientific and technical progress find reflection in the plans almost automatically. The provisions of the programs are used by planning workers when drawing up the five-year and annual plans of the development of science and technology at organizations and enterprises. At the same time, according to the data of the State Committee for Science and Technology, in more than 40 percent of the cases the irregularities in the fulfillment of the state scientific and technical programs during the 11th Five-Year Plan were due to the untimely and inadequate supply of material and financial resources, production capacities, and limits of capital investments and contracting operations. One disruption in five is explained by the delays with the delivery by ministries and departments of the tasks for the performing organizations or by the fact that the assignments were not included in the plan [3]. It is necessary to consider that from 1-2 to 100 performers take part in the implementation of state scientific and technical programs. The regional comprehensive programs of scientific and technical progress are called upon to coordinate the activity of hundreds and thousands of enterprises and organizations. Therefore, the problem of monitoring also remains very urgent for the programs which are being discussed.

At present adequate prerequisites have formed for the successful solution of the problem of organizing the monitoring of the inclusion of the directives of the regional comprehensive program of scientific and technical progress in the plans of the enterprises and organizations of the region. Thus, for example, the decree of the CPSU Central Committee and the USSR Council of Ministers "On the Further Improvement of the Planning of the Comprehensive Economic and Social Development of Moscow and Leningrad" charges ministries and departments to examine jointly with the Moscow City Soviet Executive Committee and the Leningrad City Soviet Executive Committee the drafts of the five-year and annual plans of the development of the subordinate associations of enterprises and organizations, which are located in Moscow and Leningrad, up to the

submitting of these drafts to the USSR State Planning Committee and the RSFSR Council of Ministers. At this stage the analysis and monitoring of the conformity of the submitted drafts of the plans to the assignments of the comprehensive program of scientific and technical progress should also be organized. In our opinion, the sectorial departments of the planning commissions of the executive committees of the local soviets under the supervision of the departments of the consolidated plan of the region can take this work upon themselves.

As it seems, the use of the listed proposals in practice will make it possible to ensure the unconditional practicability of the regional comprehensive programs of scientific and technical progress and to turn them into an effective tool of territorial management.

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6. See, for example, "Metodicheskiye rekomendatsii po razrabotke kompleksnoy programmy nauchno-tekhnicheskogo progressa g. Moskvy na 1991-2010 gg." [Procedural Recommendations on the Formulation of the Comprehensive Program of Scientific and Technical Progress of Moscow for 1991-2010], Moscow, IEP g. Moskvy, 1984; "Sovershenstvovaniye upravleniya nauchnymi issledovaniyami i opytno-konstruktorskimi rabotami. Tezisy vsesoyuznogo seminara" [The Improvement of the Management of Scientific Research and Experimental Design Work. Theses of an All-Union Seminar], Moscow, VNDKh SSSR, 1981; Byalkovskaya, V.S., "Programmno-tselevyye metody v razvitii promyshlennosti" [Goal Program Methods in the Development of Industry], Moscow, Ekonomika, 1983; "Kompleksnaya programma nauchno-tekhnicheskogo progressa v regione: Metodologicheskiye osnovy razrabotki" [The

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CONFERENCES AND EXPOSITIONS

NEW WAGE TERMS FOR SCIENTISTS, DESIGNERS, PROCESS ENGINEERS

Moscow SOTSIALISTICHESKIY TRUD in Russian No 2, Feb 86 pp 32-44

[Article by V. Spirkin under the rubric "Labor and the Economic Mechanism": "With Allowance Made for the Personal Contribution to the Acceleration of Scientific and Technical Progress"; first three paragraphs are SOTSIALISTICHESKIY TRUD introduction]

[Text] In conformity with Decree No 462 of the CPSU Central Committee, the USSR Council of Ministers, and the All-Union Central Council of Trade Unions of 22 May 1985 new conditions of the remuneration of the labor of workers of academic science and designers and process engineers of industry are being introduced starting this year. It is envisaged, in particular, by means of the saving of the wage fund to establish for them an increment in the amount of up to 50 percent of the salary for the fulfillment of the most difficult and responsible jobs with allowance made for the personal contribution.

An open and interested discussion on how to best implement this decree took place at the business meeting which was organized by the editorial offices of the newspaper of the CPSU Central Committee SOTSIALISTICHESKAYA INDUSTRIYA and the journal SOTSIALISTICHESKIY TRUD. Responsible officials of industrial ministries and managers of production associations and enterprises, scientific research institutes and design bureaus, including participants in the well-known Leningrad experiment, were invited to the meeting.

We are publishing a report on this meeting.

The utmost acceleration of scientific and technical progress in all sectors of the national economy is a vital question of the economic policy of our party at the present stage and in the future. In the solution of this strategic problem a key role is being assigned to science, as well as to machine building, which are called upon to update rapidly the production system on the basis of advanced equipment and progressive technology and on this basis to increase labor productivity by many fold. And this is the main thing for the triumph of the new social system. During the coming 15-year period it is planned to increase labor productivity by 2.3- to 2.5-fold.

Our state is devoting much attention to science. The allocations for its development are increasing annually. During the past two five-year plans they

have increased by twofold and have reached 29 billion rubles a year. The number of people employed in science and scientific service is increasing intensively. We speak with pride about the fact that one scientist in four on earth is our Soviet scientist.

"An enormous scientific and technical potential has been created in our country," N. Yakovchuk, deputy chief of the Scientific, Design, and Planning Organizations Department of the USSR State Committee for Labor and Social Problems, said in her statement. "Our scientific and technical achievements are also indisputable, although they can be significantly greater."

Today the national economy is not receiving an adequate return from the large investments in science. Of course, the most diverse factors have an influence on the magnitude of this return. They are the proper choice of scientific directions, the level of organization of research and development, the shortening, condensation of the entire research and introduction cycle, the circulation of completed developments, and so on. The questions of the remuneration of labor and material stimulation hold not the last place on this level.

Such a point of view that in science it is impossible to measure and evaluate the personal contribution and on its basis to implement the socialist principle of payment according to labor, because scientific labor is especially creative, just as the labor of designers, and it does not lend itself to quantitative and qualitative measurement, was current until recent years. In this connection the external attributes of the activity of the worker, first of all whether or not he had an academic degree and the length of his scientific teaching work, were chosen when formulating the wage policy. Stable salaries, which were established subject first of all to these data, and not to the quality of the labor of the worker, were in effect for nearly 30 years. With the years it became clear that such a system of the organization of the wage had turned into a kind of destimulant. Therefore, 15 years ago an attempt was made to link the evaluation of the results of labor with the amount of the wage of the specific worker. The collective of the Scientific Research Institute of Physical Chemistry imeni L.Ya. Karpov emerged as the initiator.

It should be added to this that the mechanism of the "Karpov" system of the remuneration of labor is quite well known. The journal SOTSIALISTICHESKIY TRUD, in particular, also wrote about this. (Footnote 1) (N. Yakovchuk, "The Labor and Wage of the Scientist," SOTSIALISTICHESKIY TRUD, No 1, 1984) Let us recall merely the essence of its basic components. First of all this is a quite flexible system of salaries (minimum and maximum), which are established with respect to each position. Their specific amounts are determined in accordance with the results of periodically conducted certification. The wage fund, which has been approved for the institute, remains constant, in spite of the decrease of the number of personnel. It can be changed only in case of a significant increase or decrease of the amount of scientific research work. The director of the institute in consultation with the trade union committee is granted the right to approve the statute on the payment of bonuses to workers.

Last year 69 scientific research institutions, at which about 3 percent of all the scientists of the country are employed, operated in accordance with the "Karpov" system. Among them there are not only applied, but also academic institutes, which engage mainly in basic research. There is no uniform statute on certification, at each of them its own means to measure and evaluate the real contribution of the scientist has been found.

In the design and technological services of five Leningrad associations they took a different route. (Footnote 2) (N. Amonskiy and A. Stepanov, "The Leningrad Experiment: The First Results," SOTSIALISTICHESKIY TRUD, No 4, 1984; V. Saytsev and N. Spirin, "The Efficiency of the Labor of Designers and Process Engineers Is Increasing, Their Wages Are Growing," No 10, 1984; V. Kalinin and N. Amonskiy, "Engineering Labor: How to Increase Its Efficiency," No 12, 1984) There not the amount of the salary is being changed, but increments for the fulfillment of a specific assignment are being established. Within the stable wage fund, which has been approved for the entire period of the experiment, it is permitted due to the decrease of the number and other organizational factors to use the entire balance of the wage fund for various stimulating payments. The increment for designers for the period of the fulfillment of especially difficult and responsible jobs, as practice showed, became the main one of them.

"Why are we now recalling this?" continues N. Yakovchuk. "Because the route, which the Leningraders and their followers, as well as the institutes, which are using the 'Karpov' system, took, is very fruitful and instructive. And the decree 'On the Improvement of the Remuneration of the Labor of Scientists, Designers, and Process Engineers of Industry' (Footnote 3) (N. Yakovchuk, "Improve the Remuneration of the Labor of Scientists, Designers, and Process Engineers," SOTSIALISTICHESKIY TRUD, No 9, 1985) absorbed the components of both systems of the remuneration of labor, which had justified themselves."

Today the task consists in the practical implementation of this decree. In it the rights of the managers of scientific and design organizations are broadened significantly, but many of them are experiencing bewilderment and do not know how to exercise these rights. That is why it is so important to use the already gained experience. The task is being posed to pay for the labor of the scientist, designer, and process engineer with allowance made for the personal contribution. But how is it to be measured and evaluated? The criteria can be most diverse. If it is a question of the establishment of a salary for a period of 3-5 years, the evaluation, apparently, should be a more versatile one, which takes into account the individual peculiarities of the worker, his outlook, initiative, and erudition, and his organizing data. And first of all, of course, the result of labor should be evaluated. When granting an increment the set of criteria can be narrower. Some institutes proceeded in the direction of a point evaluation, then rejected it, and began to use mixed evaluations, others evaluate the labor contribution only by the expert method. This experience is also of enormous practical value.

The evaluation within the Leningrad experiment of the results of the labor of designers and process engineers is based on the use of the standards of labor expenditures, the standards of the quality of labor, and sets of coefficients that take into account the complexity and quality of the performed jobs,

creative activeness, and the timeliness of the fulfillment of assignments, which exist at the enterprises. Moreover, the coefficient of labor participation and point systems of evaluation, in which the degree of novelty of the proposed solutions and their effectiveness are taken into account, are being used.

Various methods, in which the introduction of developments and the economic impact, the quality and time of the completed jobs, the proportion of basic research, the existence of certificates of authorship, patents, licenses, articles, reports, and other publications, the state of labor and production discipline, and participation in the training of scientific personnel are taken into account, are being used when evaluating the effectiveness of the labor of scientists.

In the opinion of the participants in the business meeting, the existing methods of evaluating the efficiency of labor can be improved substantially. Thus, in case of the evaluation of the activity of designers and process engineers for the present the qualitative aspects of their activity, which are not taken into account in the standards of labor expenditures, are not finding enough reflection. For the elimination of this shortcoming it would be advisable to adopt the experience of the evaluation of the quality of work, which has been gained at scientific research institutes, and by that in turn it would be useful to take into account the experience of the evaluation of the efficiency of the labor of designers on the basis of the use of a standard base.

The check made by the USSR State Committee for Labor and Social Problems showed that when preparing for the introduction of the new conditions of the remuneration of labor particular attention was devoted to the use of the reserves which lie on the surface. There are not enough thorough, scientifically sound approaches to the identification of the substantial reserves of the increase of the efficiency of the labor of researchers and developers, to the shortening of the cycle of research and development, and to the improvement of the technology of operations with the combined use of equipment. Too little attention is being devoted to the broadening of the use of computer-aided design systems, computer hardware, and office automation facilities.

At many scientific research institutes the labor of scientists at present is not being standardized. But at the All-Union Scientific Research Institute of Materials Handling Machine Building for 5 years now time allowances for scientific research work have been used successfully in case of the planning and monitoring of the workload of the performers, as well as for the determination of the time and cost of the fulfillment of themes and individual stages. It is necessary to step up the elaboration of standards for applied research work for the purpose of the more uniform workload of workers and the increase of the productivity of their labor. In the plan of organizational measures on the changeover to the new conditions of the remuneration of labor a number of organizations and enterprises are envisaging in 1986 the elaboration of local time allowances for research work, their use will make it possible to free approximately 5-8 percent of the actual number of scientists.

The labor of designers is being standardized mainly in accordance with sectorial time allowances, which have been calculated on the basis of the intersectorial Standard Time Allowances for the Elaboration of Design Documents. At the same time allowances, the intensity of which is often significantly less, are also being used.

The decree envisages that USSR ministries and departments, the councils of ministers of the union republics, the USSR Academy of Sciences, and the managers of associations, enterprises, organizations, and institutions should establish standards of the formation of the wage fund for the five-year plan on the basis of the outlined amounts of work. The value of the standard, apparently, should be specified with allowance made for the degree of intensity of the allowances which are in effect at the given organization as compared with the all-union standard allowances for design operations.

At a number of scientific research institutes and design bureaus the consolidation of the basic structural subdivisions, the uniting of auxiliary scientific services, the elimination of inefficiently operating subdivisions, the improvement of the standard base, the determination of the sources and the calculation of the necessary assets, the carrying out of certification when introducing the new conditions of the remuneration of labor, the abolition of superfluous positions, and the freeing of workers are envisaged in the plans of organizational measures. Thus, at the All-Union Institute of Fiber Glass Plastics and Glass Fiber in accordance with the suggestions of the labor collective it is planned to reorganize the basic research departments. Instead of 5 departments for problems of fiber glass plastics it is proposed to have 3 with more than 100 people each. Researchers, designers, and experimenters, who are capable of solving an important research problem from start to finish, will belong to them. The organizational reform is being carried out in all the main directions of the work of the institute--glass fiber, fiber glass fabric, and fiber glass plastics. Here in the last of them alone it is planned to abolish the positions of chiefs of departments and four positions of chiefs of sectors. The management of the groups will be assigned to the leading and chief scientific associates.

At the end of last year the Ministry of Tractor and Agricultural Machine Building, for example, held in Kirovograd a sectorial seminar, at which the standard documents necessary for the introduction of the new conditions of the remuneration of the labor of these workers were discussed. A special commission, which in conformity with these documents already last year engaged in the search for additional assets for increasing salaries and introducing increments to them, was established at the All-Union Scientific Research Institute of Tractor and Agricultural Machine Building. It is envisaged, in particular, to free not less than 120 workers. Of them 60 are to be freed due to the introduction of the brigade form of the organization and remuneration of the labor of designers and process engineers, 10--due to the improvement of the structure of management, 30--due to the improvement of rate setting, and 20--due to the equipment of workplaces with computer technology.

At this scientific research institute the collection of sectorial time allowances and prices for the designing of equipment of one's own making is being used for the standardization of the labor intensiveness of design

operations. But they are little suited for the standardization of technological operations, since for the most part they are intended for series production. Thus, it is necessary to calculate them.

Starting in January of last year they began to use here as an experiment the brigade form of the organization of the labor of designers, which yielded good results. Thus, labor productivity in the brigades increased on the average by 20 percent, the wage increased by 13 percent. It is planned to involve process engineers and scientists in the brigades.

With the changeover to the new conditions of the remuneration of labor it is envisaged to place 75 percent of the saving of the wage fund at the disposal of the chiefs of departments and to allocate 25 percent for the formation of the centralized fund, which will be used first of all for the stimulation of the development of a scientific and technical reserve on the basic problems which have been attached to the institute.

As to the increments, it is planned to differentiate them by two types: for high skills--up to 30 percent of the salary for a period of 1 year; for the shortening of the time of the fulfillment of especially complicated and responsible jobs--up to 50 percent of the salary for a period from 1 month to a year.

The decree of the CPSU Central Committee, the USSR Council of Ministers, and the All-Union Central Council of Trade Unions aims enterprises and organizations at the performance of operations with a smaller number of personnel. The means of accomplishing this task are diverse. One of them is the introduction of the brigade form of the organization and stimulation of labor, which they adopted at the Ulyanovsk State Special Design Bureau of Heavy-Duty and Milling Machines, about which SOTSIALISTICHESKIY TRUD has also written. (Footnote 4) (A. Zhdamirova and N. Makarov, "Brigade Organization for Engineering Labor," SOTSIALISTICHESKIY TRUD, No 2, 1985)

Brigades, to which engineering and technical personnel engaged in the designing of machine tools, machines, and objects belonged, were established here 5 years ago on a voluntary basis. A condition of the establishment of such brigades is that the estimated cost of a design can be determined according to sectorial and intersectorial standards. A job sheet, in which the basic quality indicators and technical parameters of the object being developed, the estimated economic impact, the time of completion of the work, the amount of the wage, and the tentative amounts of the bonuses for the achievement or exceeding of the planned results are envisaged, is issued to each of them. All the brigades work on a single order and are cost accounting.

The collective wage is distributed in conformity with the actually performed amount of work, the salary, the time worked, and the coefficient of labor participation, which is established by the council of the brigade. The bonuses for the development and introduction of new equipment, which are allocated to the brigade, are also distributed in conformity with the coefficient of labor participation. The wage prior to the completion of the job sheet is paid as an advance. Its amounts are calculated monthly and are

determined on the basis of the level of completion of the job sheet in conformity with a schedule which has been approved by the administration. If the work has been completed on time or ahead of schedule, up to 30 percent of the amount of the extra pay, which was obtained during the given month, as a rule, is paid. Upon delivery of the contractor design of the machine tool to the manufacturing plant with allowance made for the parameters stipulated in the job sheet the second part of the advance is paid. The workers of the brigade receive the remainder after the production of the machine tool in metal on the condition of the achievement of the results envisaged in the job sheet. If the designs have been completed with defects, the brigade is obliged to eliminate all the design imperfections which have been detected in the process of producing the machine tools at the client's.

Owing to the use of the brigade form of the organization of engineering labor the amount of performed work at the state special design bureau increased by nearly 30 percent, here the staff was reduced by more than 5 percent. The prototypes of especially heavy-duty planer-type milling and boring machines with numerical control and the automatic change of the tool were designed and put into production in the shortest possible time.

The strengthening of the collectivistic principles as a result of the establishment of brigades contributed to the increase of the prestige of designers' labor and as a consequence to the establishment of stable collectives and the improvement of the use of working time. Thus, the turnover of personnel decreased by 25 percent, while leave of workers with permission of the administration to see to their personal affairs decreased to nearly one-half.

The Ulyanovsk experience of using contractual forms of the organization and stimulation of labor in case of the development of new equipment has aroused great interest among enterprises and organizations of various sectors of machine building. It can be used not only for designers, but also for other categories of engineering and technical personnel and employees first of all in jobs which have standards of the number or labor expenditures. The system of the remuneration of labor and the payment of bonuses for the end results of work makes it possible to increase substantially the labor productivity of engineering and technical personnel and to ensure the fulfillment of the plan assignments with a smaller number. The distribution of the brigade wage by means of the coefficient of labor participation contributes to the increase of the quality of engineering labor.

The principles of the brigade form of the organization and remuneration of engineering labor should be based on cost accounting, the comparison of the expenditures and results, and the consideration of the contribution of each person. Its use makes it possible to increase substantially the role of labor collectives in the management of scientific and technical progress.

Among the five Leningrad associations, which are participating in the experiment on the improvement of the remuneration of the labor of designers and process engineers, is the Izhorskiy zavod Production Association imeni A.A. Zhdanov. Due to the 6-percent decrease of their number the wage of this category of workers was increased here on the average by 10 percent.

"We believe that the salary increment of the designer and process engineer is the most effective measure of the increase of the efficiency of engineering labor."

"It this a lot or a little?" Yu. Ilin, deputy chief engineer of the association, asked the participants of the meeting. And he answered it himself: "We believe that this is an appreciable wage increase. But the main thing is that the opportunity has appeared for the managers of the design and technological subdivisions to use the saved assets, to commend the most conscientious, capable, and talented people, and to punish negligent people by the ruble. We divide the entire saving of the wage fund, and here it is, as is known, stable, into three parts. The first part is used for the increase of salaries, the second--for the establishment of increments, and the third--for supplementary payments for the completion of jobs with a smaller number. The first item, frankly speaking, we use with great caution. We have come to the following conclusion: the worker quickly becomes accustomed to his own increased salary and leaves it at that, and further his activity fades. We are trying to spend more assets on the establishment of temporary increments. The experience of more than 2 years shows that this is the most effective measure of the increase of the efficiency of engineering labor. Here we are devoting the basic attention to the quality and reliability of the equipment being produced."

Question: Whom are you releasing and by what principles are you guided in so doing?

Answer: Certification takes [illegible]der the conditions of extensive publicity. A certification shee[illegible]ference, in which a comprehensive evaluation of his activity: what [illegible]ition he has made and what new designs he has developed, is given, are prep[illegible]d in advanced for each worker. His conformity or nonconformity to the held position is also determined in accordance with these indicators. When the person being certified has familiarized himself with the opinion of himself, he, as a rule, admitted its objectivity, or if he felt that he "is not keeping up," as a rule, he asked that he be transferred to a different position where the work will be within his capability. For the most part such workers remained at our association and transferred to a shop as foremen or to another position. People of retirement age (30 percent of those released) believed that under the conditions of the experiment it would be difficult for them to work and decided to leave for deserved rest. And in all we released 183 engineering and technical personnel.

Question: They say that during the experiment the number of submitted efficient proposals and inventions decreased. Is that so?

Answer: No, it is not. True, we expected in the process of the experiment a significant increase of the creative activity of efficiency experts and inventors. And although the number of their proposals did not increase, there were a larger number of important collective inventions and technical innovations and fewer insignificant ones. I will cite one example. Imagine the steam generator of a nuclear plant. Externally this is a gigantic metal

vessel weighing about 300 tons. We have been producing them for 20 years now and are sending them via railroad on special articulated transport, welding enormous shells to the housing before hand. At the site they are cut off by flame, as a result of which the steam generator is frequently damaged. And now the group of designers and process engineers has found a solution. It developed a special carrier with the use of railroad trucks, on which it is possible, as into a cradle, to place the steam generator, to deliver it punctually to the nuclear electric power plant, and to remove it there without any trouble. This is yielding a large impact.

The combining of science with production is an important factor of the acceleration of scientific and technical progress and the supply of the national economy with advanced high-performance equipment. The experience of another Leningrad association--the Elektrosila Association imeni S.M. Kirov, to which a scientific research institute belongs, attests to this.

"The union of science and production is a powerful factor of the acceleration of scientific and technical progress and the increase of the efficiency of social production."

"We are also working under the conditions of the experiment," S. Fridman, chief of the labor and wages department of this institute, stated. "Moreover, we also have several plant subdivisions, such as the department of the chief metallurgist, the department of insulation materials, the department of scientific and technical information, and others. All the design services of the association for the development and introduction of new equipment are concentrated at the institute. It seems to us that one of the main merits of the experiment is the fact that it broke the foundations which formed over the decades, when the managers of the department or laboratory was 'squeezed' from all sides. They gave him the plan and demanded that it be fulfilled without fail, but did not give him adequate rights. The experiment untied his hands. They began to plan the wage fund for him and granted him the right to manage it. It is not necessary to observe the average level of salaries and to maintain the ratio of senior and junior scientific associates. The manager of the scientific subdivision in consultation with the general director of the association now establishes the increment for specialists. We believe that precisely the increment, and not the salary, should stimulate the increase of the creative output of the scientist and the engineering and technical worker. We are developing more thoroughly the criteria of the evaluation of their labor, a reference base for this exists. The question: Will the standard of the wage, which was established for us for the period of the conducting of the experiment, be retained for the 12th Five-Year Plan? worries us most of all. Our anxiety is due to the fact that the amount of research and development has been increased significantly for us, while we should fulfill it with the same number."

Question: By means of what tool do you evaluate the labor of specialists in case of the establishment of increments?

Answer: We took the model standards, which were developed by the Scientific Research Institute of Labor, and applied them to the conditions of our work and to the specific nature of the electrical equipment industry. In

accordance with these standards it is possible to standardize up to 70 percent of the design and technological operations.

At the Nevskiy zavod Association imeni V.I. Lenin when calculating the standards for scientific research work they decided to change over from a quantitative estimate in standard hours to a cost estimate. Well, such an version is also possible. They are attaching great importance here to the evaluation of the quality of labor.

"The Leningrad experiment is aiming its participants at the speeding up of the development of equipment, which conforms in its parameters to the best world models and surpasses them."

"For this we have the standard of the enterprise," V. Nikitin, the representative of this association, explained, "by means of which it is possible to evaluate quite objectively the quality of the labor of the collective and the individual performer. The criteria of the evaluation are broken down into four levels, its own coefficient corresponds to each of them. The amount of the bonus is determined according to the sum of these indicators. The salary increment is established with allowance made for the labor intensiveness and difficulty of the job being performed. The control commission settles controversial questions. It checks the correctness of the proposed evaluations and coefficients. And if it detects any deviations, it takes the appropriate steps.

"Of course, the Leningrad experiment has yielded much. It aimed its participants at the speeding up of the development of products, which conform in their technical and economic parameters to the best world models. And today this task has been placed at the level of the program requirements of the party."

"The problems of stimulating the labor of scientists, designers, and process engineers must be solved as the same time as the improvement of the management of scientific and technical progress."

"Last year 12 enterprises and organizations," K. Pashkevich, deputy chief of an administration of the Ministry of the Electrical Equipment Industry, said, "in all more than 6,000 people, worked in our sector in accordance with the know-how of the Leningraders. We looked at this experiment first of all from the standpoint of the changeover of the economy to the path of intensive development. And here is what is conspicuous. Scientific research became more thorough. The development of new equipment was expedited. A large saving was obtained, but at the final stages of the cycle 'from the design to introduction' it was lost a times. Therefore, the national economy as a whole received less than it could have. In this connection the demands on the sphere of management are increasing. Under these conditions the State Committee for Science and Technology is called upon to play a large role. The question of the material stimulation of scientists, designers, and process engineers must be settled at the same time as the improvement of the management of scientific and technical progress."

Question: It is envisaged by Decree No 462 that the ministries should establish for enterprises and organizations standards of the formation of the wage fund, as a rule, for a 5-year period on the basis of the planned amounts of work. What has been done in this respect by the Ministry of the Electrical Equipment Industry?

Answer: Our technical administration is dealing with this question.

Question: Have sectorial standards for design and technological operations been approved there?

Answer: The elaboration of standards is a lengthy process, but we have begun this work....

V. Makarov, deputy director for scientific work of the Institute imeni L.Ya. Karpov

"When they speak about the 'Karpov' system, which originated 15 years ago at our institute, many people interpret it in a too simplified manner, they say that it is a matter of improving the remuneration of the labor of scientists. But the essence of the matter lies not only in this. An integrated system of management, which is aimed at increasing the efficiency and quality of scientific research, has been formed here. The main directions of the work have been specified, the specific problems, in the solution of which the abilities of people are revealed, have been clearly formulated. Opportunities have been created for everyone for creative growth: be it the chief of a laboratory or a junior scientific associate. Everyone, including the director of the institute, is taking part in scientific research work. By using our system, we have increased by nearly twofold the amount of work, while the number of personnel has even decreased. The number of certificates of authorship, which are being used in our developments, has increased by approximately fourfold.

"Certification is a component of this system. Here it is multistage. First the immediate chief of the specialist, then the section certification commission and, finally, the central certification commission give him an evaluation. In case of disagreement with its decision the person being certified can submit an appeal to the director of the institute and demand that they hear it in the scientific council. After which the certification commission reconsiders the question and makes a final decision. Of course, there were also dissatisfied people. But not with the fact that they reduced their salary. They appealed mainly with regard to the fact that when increasing the wage not everything good was taken into account. But for all this there was a normal atmosphere in the collective, not excesses occurred. The people understood that they had been told the truth. We are striving to free scientific associates from routine work, so that they would devote 80-90 percent of the working time to creative research."

V. Moskvin, chief of a sector of the Scientific Research Institute of Labor

"The decree, about which we are talking today, will promote the improvement of the organization of science. First, the real possibility of bringing the

systems of the management of research and development in line with the advanced directions in this area is appearing. In particular, the introduction of chief and leading scientific associates will make it possible to realize more closely the idea of matrix structures of management. Second, a situation, in which the most serious attention should be devoted to the questions of the standardization, planning, evaluation, and certification of the labor of workers, is forming. And, third, better conditions are being created for the growth of scientific youth, which is very important.

"It should be noted that the existing system of the standardization and planning of jobs actually does not aim researchers, designers, and process engineers at the search for fundamentally new solutions and the development of creativity. It is well known that the greater and more fundamental the novelty of a proposed technical solution is, the more time there is required for its development and the greater the risk of failure is. It is economically unprofitable to take risks here. In case of success the performed work is credited in conformity with the established standard regardless of the achieved scientific and technical level. In case of failure they can reduce for specialists the salary or decrease the increment to it. Therefore, such a suggestion, which is aimed at the stimulation of creativity and justified risk, seems advisable. Assignments should be given to performers in accordance with standards which have been established for the actually achieved level of developments. If specialists by means of the introduction of new solutions achieve an increase of this level, the amount of the performed work is evaluated not according to the planned standard, but according to an increased standard; it is borne in mind that a greater labor intensiveness also corresponds to a more complex development. In short, flexible standards, which stimulate workers for creative research and risk taking, are needed. Of course, it is difficult to develop such standards, but the goal deserves this.

"In the decree it is emphasized that one of the main tasks is to ensure the closer connection of the remuneration of the labor of scientists, designers, and process engineers with their personal contribution to the acceleration of scientific and technical progress. Therefore, the evaluation of the labor of this category of workers should be based first of all on their personal creative contribution to the elaboration of new scientific and technical solutions and to the development of fundamentally new highly efficient equipment and technology. This evaluation of the contribution to the overall result of the collective should also serve as the basis for the determination of the amounts of the salaries and the increments to them."

"In the development of fundamentally new equipment the scientist and the designer should have the right to take risks. Such an aspiration must be encouraged in every way."

And Candidate of Technical Sciences Yu. Kostyukovskiy, who stated that it is necessary to use more completely the experience, which is available in nearly every sector of the national economy of our country, of developing and using various methods of evaluating the labor contribution of specialists, managers, and technical performers, is absolutely correct. The analysis of this

experience at such leading enterprises and organizations as the Sumy Machine Building Scientific Production Association imeni M.V. Frunze, the Kharkov Physical Technical Institute of the Ukrainian SSR Academy of Sciences, and many others makes it possible to formulate the demands on such evaluations and the systems of the stimulation of labor, which are based on them.

When establishing the norms and standards of labor expenditures for the work being performed it is necessary to take into account not only its complexity and novelty, but also the quality, as well as the scientific and technical level of the study or development. It is now especially important to direct attention to the technical and economic characteristics of the best domestic and foreign analogues and to strive to achieve, and then surpass them.

I would also like to touch upon another question. The new terms of the remuneration of the labor of scientists, designers, and process engineers are being introduced within the limits of the planned wage funds. But in order to have the assets for these purposes, it is necessary to improve the structure of management, to eliminate individual subdivisions, to unite small ones, and so on, here a portion of the workers will have to be released. The same thing will also occur during their certification. In this connection difficulties may arise in placing the released workers in a job in their specialty, especially in labor-saturated regions and cities. The republic and local organs for labor and other organizations should be prepared for this.

"It is necessary to increase the wage of scientists and engineers in close connection with the increase of the economic impact, which is obtained by the country from the implementation of their developments, and to compare the expenditures with the national income."

"Of course, it is very important to remunerate the labor of scientists, designers, and engineers in a differentiated manner, subject to their actual contribution to the acceleration of scientific and technical progress," P. Osipenkov, chief of a department of a scientific research institute of the Academy of Social Sciences attached to the CPSU Central Committee, stated. "But there is another, no less important aspect of the problem of improving the organization of the wage of specialists. It is a matter of the dynamics and overall level of their earned income as compared with the growth rate and achieved average 'value' of the wage of other categories of personnel and first of all of workers. For the undervaluing of the labor of engineers and scientists in the age of scientific and technical progress is fraught with great costs and the underutilization of the potential means of the development of the productive forces of society.

"The difficulty of solving this problem stems from the fact that in recent years in connection with the decline of the growth rate of the national income the possibilities of allocating assets from the state budget for significant one-time increases of the wage of large categories of personnel have decreased. And such a method of increasing earned income, as practical experience has shown, is also not sufficiently effective. It does not make it possible to use fully the multibillion amount of the increase of the total wage fund as a means of ensuring the thorough interest of personnel in high

end results of labor, the acceleration of the intensification of production, and the increase of its efficiency on the basis of the rapid assimilation of the achievements of scientific and technical progress.

"The increase of the wage, first of all of engineers and scientists, should be closely connected with the amount of the economic impact, which the national economy obtains from the implementation of their scientific and technical developments. Thereby the prerequisites can be created for the solution of an entire set of interconnected problems.

"First, this will increase the orientation of engineering and technical personnel and scientists toward the obtaining of the maximum possible economic impact from their solutions and developments and will accelerate scientific and technical progress.

"Second, the more efficient activity of specialists of the highest skills will create an additional source of assets for the increase of their wage.

"Third, the establishment of the direct dependence of the wage on the economic efficiency of engineering, scientific, and technical developments will lead to the more rapid increase of the earned income of engineering and technical personnel and scientists and to the gradual achievement of the objectively necessary ratio between the levels of the wage of these specialists and workers.

"The granting of great rights to the managers of labor collectives in the area of the regulation of the dynamics and absolute levels of the wage of various categories of personnel is an important condition of the accomplishment of this in practice. In this connection, in our opinion, the coefficient-proportionate method of determining the wage of engineering and technical personnel and scientists, which is now being used in part in brigades, but is of universal importance, should be used more extensively."

"Foremost attention must be devoted today to the human factor and the increase of the role of labor collectives, which have been granted great rights in management and distribution."

The human factor in the acceleration of the socioeconomic development of our society is exceedingly great. V. Shcherbakov, chief of the Machine Building and Metal Processing Department of the USSR State Committee for Labor and Social Problems, devoted much attention to this in his statement.

"What kind of production we will have tomorrow and in what place in the world we will come out by 2000," he said, "depends in many ways on our scientists, designers, and process engineers, who are in the front line of the campaign for the acceleration of scientific and technical progress in all the sectors of the national economy. The decree of the party and government is also aimed at the solution of this problem.

"But in addition to the questions of improving the remuneration of labor other ideas are also incorporated in it. It is a question of the reorganization of

all our work--the overcoming of the conservatism of economic thought, the development of a favorable microclimate in every scientific and engineering collective. Here the role of the human factor is increasing. Let us take, for example, certification, about which much has been said here. It is a matter not of increasing or decreasing the salary by 20 or 30 rubles. The main thing is that certification creates a public opinion about a person, the collective itself gives an evaluation of his labor. This is both the practical use of the Law on Labor Collectives and the direct participation of the working people in management.

"The need for the standardization of the labor of the worker does not arouse anyone's doubt. But in the work of a good tool maker or machine tool operator there is no less creativity than in that of a designer or process engineer. Norms are not frightening to those who know how and want to work. They do not hinder conscientious workers. Those who want to receive a bit more, but to work a bit less, are opposed to them. Among them there are also many engineering and technical personnel, who are attempting to show that, they say, it is impossible to standardize their labor. It is possible and necessary.

"Great rights have been granted to the managers of production associations and enterprises, scientific research institutes and design bureaus. It is necessary to exercise them, and not to wait for directions 'from above,' instructions and circulars. It is necessary to convert design and technological organizations to cost accounting, to compare the expenditures with the results, and to increase the responsibility of everyone. And then it is possible to change over to contractual principles of the organization and remuneration of labor."

N. Yakovchuk spoke in conclusion. She answered the questions of the participants in the business meeting.

"Some comrades have taken an interest in when the standard documents, which are envisaged by Decree No 462, will appear. They have already been prepared and will soon see the light. In them you will find answers to many questions which were asked here.

"Today a radical psychological change is needed, whether or not some people want this. Some managers are accustomed to a post with an indication of where to go and what to do being placed at every gate. Today one should not count on this. All the problems, which are connected with the improvement of the remuneration of the labor of scientists, designers, and process engineers, must be solved creatively at the local level, in the labor collectives. And the decree, which was discussed here, is affording great opportunities for this.

"Alarm concerning the further fate of the Leningrad and 'Karpov' experiment was heard in several statements. As to the design bureaus and institutes, which were the first to adopt them, they, in our opinion, should become a unique testing ground of the further intensification of cost accounting in the sphere of scientific and technical progress and the elaboration of the

principles of mutual responsibility and interest between the developer and the client and a genuine school of advanced know-how."

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